ANALYSIS OF AGRICULTURAL INPUT SUPPLY SYSTEM: THE CASE OF DALE WOREDA, SOUTHERN NATIONS, NATIONALITIES AND PEOPLES' REGION

M.Sc. Thesis

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August 2009

Haramaya University

ANALYSIS OF AGRICULTURAL INPUT SUPPLY SYSTEM: THE CASE OF DALE WOREDA, SOUTHERN NATIONS, NATIONALITIES AND PEOPLES' REGION

A Thesis Submitted to the Department of Rural Development and Agricultural Extension, School of Graduate Studies
HARAMAYA UNIVERSITY

In Partial Fulfillment of the Requirements for the Degree of
MASTER OF SCIENCE IN AGRICULTURAL COMMUNICATION AND INNOVATION

By

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August 2009
Haramaya University

SCHOOL OF GRADUATE STUDIES

HARAMAYA UNIVERSITY

As Thesis Research advisor, I here by certify that I have read and evaluated this thesis prepared, under my guidance, by Kassu Kubayo Seko, entitled Analysis of Agricultural Inputs Supply System: The case of Dale *Woreda*, Southern Nations, Nationalities & Peoples' Region. I recommend that it be submitted as fulfilling the Thesis requirement.

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As members of the Board of Examiners of the Final M. Sc. Thesis Open Defense Examination, we certify that we have read, evaluated the Thesis prepared by Kassu Kubayo Seko and examined the candidate. We recommended that the Thesis be accepted as fulfilling the Thesis requirement for the Degree of Master of Science in Agricultural Communication and Innovation.

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DEDICATION

I dedicate this thesis manuscript to my Mother Bizunesh Tessema, who suffered a lot to reach me at this level.

STATEMENT OF AUTHOR

First, I declare that this thesis is my bonafide work and that all sources of materials used for this thesis have been duly acknowledged. This thesis has been submitted in partial fulfillment of the requirements of M. Sc. degree at the Haramaya University and is deposited at the University Library to be made available to borrowers under rules of the Library. I solemnly declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate.

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BIOGRAPHICAL SKETCH

Kassu, the author was born on February 14, 1962 in Southern Nations Nationalities and Peoples' Region (SNNPR), Gedeo Zone, Dilla town to his mother Bizunesh Tesemma and his father Kubayo Seko. He attended his elementary education at Dawit elementary school. He also attended his Junior and High-school education at Dilla Comprehensive Secondary school. Then joined the then Awassa Junior College of Agriculture and graduated with Diploma in Plant Sciences and Technology (PST) in November 1985.

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ACKNOWLEDGMENTS

First and foremost, I want to give my thanks to Almighty God. Then I am really happy to thank my major advisor, Dr. Ranjan S. Karippai, as without his encouragement and guidance, the completion of this work may not have been possible. Thus, I am very much indebted to him for all his support and willingness to advise me on my all efforts to successfully finalize the thesis.

I am deeply beholden to IPMS/ILRI for giving me the scholarship and covering full tuition fee and funding my M.Sc. research work. In this connection, my thanks are due to the SNNPR/ Sidama Zone Rural Development Department for its provision of the necessary support to let me join postgraduate studies at Haramaya University.

The generous assistance of Dale WARDO and IPMS office staff members allowed me to conduct data collection smoothly both in the field and in the office.

My special thanks are given to my mother, Bizunesh Tesemma, my wife, Tadelech Direse, and my children Frezer Kassu, Yared Kassu, Betelihem Kassu and Yididiya Kassu for their invaluable encouragement throughout the study period. I also appreciate the assistance of key informants of input/service providers and others for providing me valuable information during data collection.

My great gratitude goes to my friends, Tirfu Hedeto and Asefa Abraham for their heartly advice and material support.

My special gratitude goes to enumerators, the members of the sample farm respondents, and members of focus group discussions for their valuable cooperation during data collection.

LIST OF ABBREVIATIONS

ADLI	Agricultural Development Led Industrialization
AESE	Agricultural Economics Society of Ethiopia
AISCO	Agricultural Inputs Supply Corporation
AISE	Agricultural Inputs Supply Enterprise
ACRSC	Awada Coffee Research Sub Center
BoARD	Bureau of Agriculture and Rural Development
CADU	Chilalo Agricultural Development Unit
CBD	Coffee Berry Disease
CBE	Commercial Bank of Ethiopia
CTDA	Coffee and Tea Development Authority
CIAT	International Center for Tropical Agriculture
CIMMYT	International Maize and Wheat Improvement Center
CSA	Central Statistics Authority
EARO	Ethiopian Agricultural Research Organization
EIAR	Ethiopian Institute of Agricultural Research
EMTPs	Extension Management Training Plots
ESE	Ethiopian Seed Enterprise
ESE-HSSMC	Ethiopian Seed Enterprise Hawassa Shallo Seed Multiplication Company
FDRE	Federal Democratic Republic of Ethiopia
FREG	Farmers Research Extension Group
GDP	Gross Domestic Product
GO	Government Organization
HARC	Hawassa Agricultural Research Center
HH	Household
IBCR	Institute of Biodiversity conservation and Research
ICARDA	International Center for Agricultural Research in the Dry Areas
ICRISAT	International Crops Research Institute for the Semi- Arid Tropics
ICU	Input Coordination Unit

LIST OF ABBREVIATIONS (Continued)

IPMS	Improving Productivity and Market Success of Ethiopian farmers
IITA	International Institute of Tropical Agriculture
MFIs	Micro Finance Institutions
MoA	Ministry of Agriculture
MoARD	Ministry of Agriculture and Rural Development
NEIP	National Extension Intervention Program
NFIA	National Fertilizer Industry Agency
NGO	Non Governmental Organization
NSIA	National Seed Industry Agency
NSIC	National Seed Industry Council
NSIP	National Seed Industry policy
NVRC	National Variety Release Committee
NYTs	National Yield Trials
PADETES	Participatory Demonstration and Training Extension System
PAs	Peasant Associations
RCBP	Rural Capacity Building Project
REFLAC	Research Extension Farmers Linkage Advisory Council
RFF	Rural Finance Fund
SG-2000	Sasakawa Global 2000
SECCU	Sidama Elto Cooperative Crop Union
SZARDD	Sidama Zone Agriculture and Rural Development Department
SMSs	Subject Matter Specialists
SSA	Sub Saharan Africa
TGE	Transitional Government of Ethiopia
TOT	Training OF Trainers
WARDO	Woreda Agriculture and Rural Development Office

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ANALYSIS OF AGRICULTURAL INPUT SUPPLY SYSTEM: THE CASE OF DALE WOREDA, SOUTHERN NATIONS, NATIONALITIES AND PEOPLES' REGION

ABSTRACT

The farming sub-sector of Ethiopia is characterized by traditional rainfed and low techniques of production and thus, is prone to the recurrent natural calamity of drought, which leaves famine and death in its wake. Today, farmers in Ethiopia have difficulties in feeding their households on their increasingly fragmenting land, using traditional and backward techniques of production. Hence the drastic need to improve agricultural productivity and production through the adoption and adaptation of improved agricultural technologies and techniques is apparent. For modernize agriculture, a strong support system involving input supplies and other services like marketing, transport, storage, processing etc. are inevitable. This study is intended to analyze the agricultural input demand –supply system of the study area; to map the actors and their linkages, knowledge and information flows, to identify influential factors for the smooth functioning of the system and to explore the influence of policy in providing an enabling environment in relation to the input demand-supply system in Dale Woreda, Sidama Zone, SNNPR. Three stages sampling were used in which both non-random sampling and random sampling procedures were followed to select four Peasant Associations and 200 respondents. Structured interview schedule and questionnaires were used for collecting the essential quantitative and qualitative data from the sampled respondents and input suppliers respectively. To generate qualitative data, field observations; informal interview with key informants; and discussions with separate focus groups were conducted. The quantitative data were analyzed using descriptive statistical tools chi-square test, Cramer's V, Pearson and Spearman's rho Correlation coefficient, and Multiple Linear Regressions from inferential statistics. The major output of the study indicates that the system is highly characterized by relatively poor linkage and inefficient knowledge flow between actors and farmers in the study area. Moreover, input demand-supply index was significantly influenced by household head age, active labor force of the family, access to market, extension contact and type of road used. In addition to this, from the supply sector factors like organizational mandatory clarity, sufficient and irrigable seed farm, skilled man power, delay of temporary loan settlement by users, policy environment, storage facilities at grass root level, efficient marketing system, timely demand claims from users, clearly defined role and responsibilities of each partner, availability of improved seeds in terms of their germination, viability and adaptability, research centers cooperation and willingness to share resources including knowledge, farmers willingness to take risks and demand for improved crop varieties were some of mentioned factors that influence the system positively and/or negatively. As to the enabling policy environment, pitfalls identified were; inflexibility of rules and regulations, lack of strong quarantine measures on imported seeds and prolonged time given for variety release and registration were amongst all. Therefore, it is recommended that, the existing extension service should be strengthened in a way that working in harmony with relevant actors to bring about change for efficient and effective delivery of agricultural inputs/services. Likewise, policy should account the flexibility of rules on credit provision and organization of small farmers groups in addressing resource poor farmers to ensure food self sufficiency of rural community in particular and the nation at large.

1. INTRODUCTION

1.1. Background

In Ethiopia, 84% of the estimated 78 million people live in rural areas and depend on agriculture for their livelihoods. The sector contributes 41.4% of the GDP of the country. The average cereal yields are low at 1244kg/ha (World Bank, 2006).

Despite the importance of agriculture in its economy, Ethiopia has been a food deficit country since the early 1970s. A close look at the performance of the Ethiopian agriculture reveals that over the last three decades it has been unable to produce sufficient quantity to feed the country's rapidly growing human population. Even worse, the country has experienced recurrent droughts that claimed the lives of several thousands of people. It is note worthy that food aid has been accounting for a significant proportion of the total food supply in the country. For instance, Ethiopia received 726,640 metric tons of food aid yearly over the 1985-2000 periods (FDRE, 2002). This is equal to about 10% of the national food grain production.

The farming sub-sector of Ethiopia is characterized by traditional rainfed and low productive techniques of production and thus, is prone to the recurrent natural calamity of drought, which leaves famine and death in its wake. Today farmers in Ethiopia have difficulties in feeding their households on their increasingly fragmenting land, using traditional and backward techniques of production. Hence, the drastic need to improve agricultural productivity and production through the adoption and adaptation of improved agricultural technologies and techniques is apparent. This places a lot of responsibilities on agricultural support services like agricultural research and extension (AESE, 2005).

The national strategy chimes with a widely held view that poverty reduction in Ethiopia is impossible without significant growth in crop yields for major staples, and this requires improving farmers' access to fertiliser, improved seeds, agricultural credit and other inputs. However, this view is not new. Indeed, it has dominated development thinking for

the past four decades, and some developing countries have implemented it with some success, as part of a 'green revolution'. Previous Ethiopian governments have also toyed with the idea and have selectively implemented this strategy in the 1960s and 70s as part of major package programmes, although there was very little to show for it. But, no government in the country's history has given much emphasis on this strategy as the current one. Not only has it accorded priority to the agriculture sector, it has made agricultural development the centrepiece of its overall development strategy.

The Agriculture Development Led Industrialization strategy (ADLI) was officially formulated and inaugurated during the 1995 elections and continues to be the country's development strategy for the next five years. In fact, even before the strategy was officially launched, a massive extension program to diffuse agricultural technology (particularly fertilizers and improved seeds) was started as early as 1993/94 under the transitional government (EEA, 2002).

In 1993, Sasakawa Global 2000 (SG-2000), a nongovernmental organization introduced a new system of extension intervention aimed at increasing productivity and production of small holder farmers through an aggressive technology (mainly improved seeds and fertilizer) transfer program, and strengthening the linkage between the research and extension in order to streamline the process of technology generation and dissemination (SG-2000, 2002).

In order to implement the program, SG- 2000 used Participatory Demonstration and Training Extension System (PADETES), which involves the establishment of Extension Management Training Plots (EMTPs) usually half hectare on-farm and farmer managed demonstration plots established to train farmers as well extension workers on proper farm management practices. The EMTPs used improved seed varieties with their proper agronomic practices, utilized the credit made available for the purchase of agricultural inputs (mostly fertilizer), trained grass-root level development agents and farmers. The program provided facilities and incentives for outstanding farmers who used the package (Ibid).

In 1995, the then Transitional Government of Ethiopia (TGE), pleased with SG-2000's performance, launched a similar extension intervention program called the National Extension Intervention Program (NEIP) and adopted PADETES/EMPTs as its implementation instrument. NEIP took over and expanded SG-2000's operations. NEIP is considered as an instrument of the Agricultural Development Led Industrialization Strategy (ADLI). Though ADLI is a strategy for Ethiopia's overall economic development, with regard to agriculture, it has aimed at improving agriculture production and productivity and thus living standards of the rural population by demonstrating to and training participating farmers and development agents on improved cultivation practices and enhancing increased use of improved technologies (MEDaC, 1999).

The Ministry of Agriculture was not only responsible for conducting adaptive research and transfer of technology, but also played a key role in provision of inputs, particularly fertilizers and pesticides. The agricultural input supply enterprise (former AISCO, now AISE has the primary responsibility of input supply (fertilizers, pesticides, seeds and credit) for the peasant sector. AISE operates under the MOA and collates demands, arranges the importation and distribution of inputs with strong emphasis on fertilizers and pesticides. AISCO managed over 600 distribution centers throughout the country although little has been achieved in certified seed marketing and distribution (Zewde, 2004).

A necessary and integral part of the technology introduction services is the provision of improved inputs/services such as seeds, seedlings, agro chemicals, drugs, veterinary services, heifers, artificial insemination, credit, production and processing tools. Most of these inputs were supplied through the agricultural offices linked to the package. While this has contributed to the development of agriculture, several sources indicate that improved inputs/services are usually in short supply and delivery is often untimely. Government policy is now stimulating diversification of input/service provision, involving private sector (Gebremedhin *et al*., 2006).

Extension service focused in Ethiopia until about 2002 was focused on increasing production and productivity in view of achieving food security (Mathewos and Chandaragi, 2003). However, it had become apparent around 1996 that without integrating farmers in to the market, sustained growth in the agriculture sector would not be realized. Perhaps as a result, the government policy on agricultural development has recently started to emphasize the transformation of subsistence agriculture into market orientation as a basis for long term development of the agricultural sector (Berhanu *et al.,* 2006).

Imbalance between the population growth rate and the agricultural production growth rate is one of the pronounced national problems in Ethiopia. Low-level productivity, due to low level of improved technologies utilization and high risk due to adverse environment are among the most frequently mentioned major causes of the country's chronic food security problem. In order to meet the food requirements of the growing population, food grains and other agricultural products have to be increased. The immediate available means to attain the national goal of food self-sufficiency is improving productivity through improved technologies. Improved seeds, fertilizer, farming tools, pesticides etc. are some of the major productivity enhancing inputs (Ibid).

In the study area (Dale woreda), most farmers are growing coffee as the main source of income. Maize and haricot bean are cultivated mainly for alternative food source and market sale.

Moreover, farmers are experienced in using agricultural inputs through Woreda Agriculture and Rural Development Office (WARDO). Actors involved in delivering agricultural inputs are Sidama Elto Union, ESE Shallo branch; private farmers who engaged on haricot bean seed and improved coffee seedling multiplication are amongst all. There are also actors who are involved on facilitation of inputs by providing credit to the farmers like Rural Development Finance Fund and Commercial Bank of Ethiopia. One way or the other, WARDO, Awada coffee research sub center and IPMS are also

playing important role in providing agricultural knowledge related to the above mentioned crop technologies.

The WARDO, in its strategic plan, has indicated to increase the productivity of these crops by reasonable figure. But the average productivity of coffee, haricot bean and maize do not exceeded from 5, 4, 20 quintals/ha, respectively, due to poor supply of the inputs. This shows how the production is low and needs attention for further investigation regarding their use of inputs and related services, such as seeds, fertilizer, credit, etc.

Therefore, this study is made to provide information on actors involved in the system, their linkage and knowledge flow in input delivery, the influential factors for the smooth functioning of the system and the influence of enabling policy environment towards input demand-supply system by giving special emphasis on coffee, haricot bean and maize crops in the study area. The study also provides research, extension, development institutions and policy makers with valuable information that assists in improving the efficiency of communication among them.

1.2. Statement of the problem

Majority of Ethiopian farmers have been using traditional way of agricultural practices. This has contributed for low productivity of the agricultural sector. To solve these problems, governmental and non-governmental organizations have made efforts to bring about change in agricultural production system of peasant farmers. They have introduced improved agricultural technologies like fertilizers, high yielding varieties of seeds, pesticides, farm tools, etc. As a result, farmers who participated in the extension package program showed relative change in the style of their production process.

To increase production and productivity, the collective interaction of actors in the sector is a must. Agricultural input suppliers are one of the actors that are responsible to deliver according to the demand of the farmers.

However, due to the growing demands of the farmers in the study area, for improved agricultural inputs, the supply sector could not satisfy the needs of the farmers. This indicates that there are different factors directly or indirectly influencing the input supply system that believed to boost up production and productivity of the smallholder farmers. But the reasons why input-supplying system failed to satisfy the needs of the farmers is not analyzed so far in the study area. Therefore, this study focused on identification of actors, their linkage and knowledge flow among actors in enhancing crop production and productivity, influential factors of the system and the enabling policy environment of agricultural inputs demand-supply system by giving special emphasis on coffee, haricot bean and maize technologies. Hence it attempts to fill the existing gap of knowledge regarding the input supply system.

1.3. Objectives of the study

The general objective of the study is to identify the constraints and strengths of input-demand supply system of the selected crops in the study area.

❖ **The specific objectives of the study are:**

- to map the actors and their linkages, knowledge and information flows in the input demand-supply system;
- to identify influential factors for the smooth functioning of input demand-supply system; and
- to explore the influence of policy in providing an enabling environment in relation to the input demand-supply system

1.4. Research questions

- Who are the actors, the status of linkage and how knowledge flow works within the system?
- What are the influential factors for the smooth functioning of input demand-supply system?
- What is the influence of policy in providing an enabling environment to the system?

1.5 Significance of the Study

To enhance production and productivity of small scale farmers, efficient and effective input/service delivery system should be on practice. To ensure this goal, relevant actors within the system should play role for effective linkage and policy implementation as to bring about change on peasant sector.

The result of this study will help to identify actors involved in input/service delivery, their role, linkage and knowledge flow within the system and influential factors that hamper the smooth functioning. More over it will also help to identify policy issues that influence the system and make some corrective measures to benefit end users. The findings of this study can also be used in guiding policy makers and development planners who are concerned about input/service provision in the region and elsewhere in the country.

1.6 Scope and limitation of the study

This study was undertaken in one woreda, namely Dale which is in the SNNPR. Since the study was limited by time, finance and human resources, there could have been some bias in the information obtained about the supply system of improved agricultural inputs related to coffee, haricot bean and maize crops.

Given the diversity of the Ethiopian population in terms of religion, ethnicity, agro-ecological climate, the communities selected are not representative of all the people in Ethiopia. As such, the research does not claim to provide conclusive findings on agricultural input demand-supply system. However, the research findings could be used to raise awareness among different stakeholders and also serve as background information for others who seek to do further related researches and would help serve in formulating and revising the system towards benefiting the farmers in the study area in particular and the region in general.

2. REVIEW OF LITERATURE

2.1 Innovation

2.1.1 Concept and definition

According to Gardner *et al*., (2007), innovation encompasses the entire process, from idea to implementation, of the development of new products, services, methods, management practices and policies. The word "innovation" is often used as synonymous with the outcome of the process, but should not confuse with "invention".

Spielman (2005) succinctly defines an innovation system as "a network of agents, along with the institutions, organizations, and policies that condition their behavior and performance with respect to generating, exchanging, and utilizing knowledge."

Moreover, an innovation system can be defined as a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect their behavior and performance. The innovation systems concept embraces not only the science suppliers but the totality and interaction of actors involved in innovation (World Bank, 2004).

Then innovation as a process is linked to learning processes and to the information and knowledge management capability that the agents and actors have different motivations and confront different challenges (Barbier, 2003).

According to Spielman *et al*. (2008), innovation agent is someone who introduces or uses such knowledge a process that entails seeking information from various sources and integrating elements of the information into social or economic practices that somehow change the behaviors and practices of individuals, organizations, or society.

Thus, innovation occurs when someone uses an invention- or uses existing tools in a new way- to change how the world works, how people organize themselves, and how they conduct their lives (Fagerberg, 2004).

2.1.2 Types of innovation

Fagerberg (2004) identified a variety of innovation classifications and some of them are:
i/ Organizational innovation – involves the creation or alteration of business structures, practices, and models, and may therefore include process, marketing and business model innovation.

ii/ Process innovation- involves the implementation of a new or significantly improved production or delivery method.

iii/ Product innovation – involves the introduction of a new good or service that is new or substantially improved. This might include improvements in functional characteristics, technical abilities, ease of use, or any other dimension.

vi/ Service innovation – refers to service product innovation which might be, compared to goods product innovation or process innovation, relatively less involving technological advance but more interactive and information-intensive.

2.2 Actors Mapping, Linkage and Knowledge Flow

Actors mapping

The purpose of this subsection is to provide information on how actors are functioning within the system- main actors and organizations in the sector with the specific roles they play; extent of linkage between actors and organizations and the nature of these linkages for supporting interaction; level of coordination, and identification any missing actor or role in input demand- supply system.

Linkage

Generation of technology is not an end by itself. It must be utilized by end users. This can be realized through the presence of effective linkage among the major stakeholders in the agriculture, agricultural knowledge and information system. Linkages between major institutional actors in agricultural knowledge and information system are widely recognized as essential for an effective flow of technology and information between research, extension and farmers. The types and nature of linkage between actors within the agricultural knowledge and information system directly influence the production and productivity of small holder farmers. It is commonly recognized by agricultural knowledge and information system stakeholders that poor performance of the system is often related to linkage problems (Akalu and Enyew, 2006).

According to Hagmann *et al*., (2002), linkages between service providers in to service delivery system are critical to 'make the system work as a system'. The different roles and mandates of service providers need to be clarified and even more important; they need to 'learn to play the roles' and work together in synergistic way towards making a difference.

Hence, to map the interactions thereby learning among the actors in the service delivery system, tools for diagnosis and institutional change in agricultural innovation systems are adopted (Hall *et al.,* 2007).

Knowledge

Knowledge can be understood as both information and skills that are acquired through individual experience and trial and error, within an organization or a learning community, or from outsiders adapting it to local contexts. Knowledge that rural and farming communities are typically interested in includes cultural management practices; new agricultural technologies; diagnostic information about plant and animal disease and soil related problems; market information on inputs and sales(prices, seller, buyers, retailers); market demand and quality of products required for these markets; and land records and government policies. The concerted efforts and practices used by organizations and

individuals to identify, create, accumulate, re-use, apply and distribute knowledge are commonly labeled knowledge management (Hartwich, *et al*., 2007).

According to Paul and Engel(1997), knowledge is not simply that is possessed and accumulated, it emerges out of process of social interaction and should be looked at in terms of social relationships. What people know and how they go about learning is intrinsically woven in to their life as social beings. Knowledge emerges as a result of social efforts to come to grips with the demands, the social and physical environments in which individuals and groups are immersed and said about knowledge that to know is to act effectively. Knowledge includes the ideas, concepts routines and skills people acquire over time to support their livelihood.

Since knowledge is dynamic, it is constantly produced and reproduced, shaped and reshaped and yields many types of knowledge, differentiated within and between localities (Mango, 2002).

According to Joshi *et al*., (2004) knowledge continuously evolves as farmers learn both by evaluating the outcome of previous actions and by observing the environment. This means that knowledge that enters a locality is not simply internalized, but becomes transformed by various actors to suit their circumstances.

The important questions need to be answered in the knowledge/information network analysis are what types of knowledge/information are important for the successful performance of the system? Who are the source user of these types of knowledge and information? Who or what are the intermediaries- the actors, printed materials or other media that move knowledge and information among actors? How effective are the existing communication networks in linking relevant sources, intermediaries and users of knowledge and information (Salomon and Engel, 1997).

2.3 Agricultural Services and Service Systems

Services to the agricultural sector are extra ordinarily heterogeneous, ranging from agricultural extension to legal counseling on land tenure issue. According to Helmut (2000), as cited by Anteneh, (2008), typical services to the agricultural sector include: agricultural research, agricultural extension and information services; education and training; rural financing (e.g. saving, credit) and insurance marketing of agricultural products and market promotion; input delivery services for plant production (e.g. seed, fertilizer, pesticides, irrigation water, machines/tools) and animal production (e.g. genetic material, forage, veterinary products, drinking water, machines/tools); regulatory services often provided by governments (e.g. certification of seeds and bio-products, quality control of agricultural products, regulations of water rights etc.) and technical support services i.e. all activities related to the provision of the technical and social infrastructure for agriculture (e.g. transport, supply of fuel and spare parts, planning of resettlement schemes etc.).

Systems theory or systems science argues that however complex or diverse the world is that we experience, we will always find different types of organization in it, and that such types of organization can be described by concepts and principles which are independent from the specific domain under consideration. Hence, if we could uncover the general laws, we would be able to analyze and solve problems in any domain, and pertaining to any type of system. The systems approach is distinguished from the more traditional analytic approach in its emphasis on the interactions and relationships between the different components of a system. Although the systems approach in principle considers all types of systems, in practice it focuses on the more complex, adaptive, self-regulating systems which can be termed “cybernetics”(Görlitz, 1989).

In systems theory, reality is seen as a complex pattern of various relationships between different elements. A system which can be defined as a simplified reproduction of a part of reality is composed of **elements** with **attributes**, i.e. their perceived characteristics, and describes the specific **relationships** between them and their **boundaries**. What is

regarded as a system (i.e., which elements and relationships are selected to form a system) depends on the perspective and the specific objectives (e.g. small-scale farmer obtaining access to agricultural inputs, private research institutions advising commercial farmers, government institutions privatizing extension services, development organization designed to improve the agricultural services in a specific region). The systems, or holistic, approach is useful when seeking to analyze and understand better the complexity of service systems (Doppler and Calatrava, 2000). In the context of services to the agricultural sector, five important aspects can be identified:

- **Type** of service: this comprises the key features (technical aspects, economic characteristics, quality aspects, effects) of an individual service such as agricultural extension, research, etc.
- **Actors of** the service system: this aspect includes the provider sub-system (service supply) and the client sub-system (use of service).
- **Functional relationships** of the service system: this includes the components of service provision (financing, delivery, assurance), the interaction of and between actors and services, and the governance of services (mode and mechanisms).
- **Level and scope** of the service system: this includes the micro-level (farm- household), meso-level (region or district) and macro-level (national) as well as the regional range of the service system.
- **Frame conditions** of the service system: this includes the technological (service infrastructure) and ecological conditions in the region in which the service system is operating, as well as the political, economic and socio-cultural conditions influencing or being influenced by the system.

Each of the above mentioned aspects can be further differentiated and analyzed in the context of sub-systems. Numerous possibilities of classifying agricultural services in a system context exist, with the emphasis shifting away from a simple technical interpretation to the processes and functional relationships of the service system itself.

Adopting a systems perspective, agricultural services can be categorized as follows (Ibid):

- Services for the application and management of agricultural inputs, such as water (irrigation), veterinary products (veterinary services), machines and tools (mechanization), pesticides (plant protection), etc.
- Services for the acquisition and management of agricultural production factors, such as land (e.g. Provision of land) and labor (e.g. hired labor).
- Services for post-production systems: these include all services related to operations, from the harvesting of agricultural products to consumption (e.g. processing, transport, storage, etc.), including the respective actors and all influencing factors and framework conditions (often referred to as "post-harvest systems").
- Supply-chain services: these include all services related to the production and postproduction of a specific commodity (e.g. cotton, tomatoes, cocoa, etc.).
- Information and knowledge services: these include services related to the creation and dissemination of agricultural information and knowledge.
- Services for innovation systems: these include all services related to the development and dissemination and utilization of a particular innovation (e.g. research, extension, input supply, etc.).
- Regional services: these include all services related to the production and postproduction of crops and livestock in a specific region.
- Public sector services: these include all services provided by the public sector as well as their political and social influence on frame conditions (e.g. legal aspects, institutional arrangements, etc.).
- Services of interest representation: these include services such as co-ordination, representation, negotiation, advocacy and lobbyism. These services are strongly related to the governance of a service system.

2.4 Seeds as Agricultural Resource Base

Seeds played a critical role in agricultural development since pre historic man domesticated the first crops 10000 years ago. The domestication of wild species into crop plants probably started with the collection, storage and utilization of seeds not only for food, but also for planting a major step in the evaluation of settled agriculture. The domestication of plants was a gradual transformation from hunting and gathering to sedentary agriculture rather than a sudden revolution. During this process conscious and unconscious selection occurred, leading to significant modification of many our crop plants from their wild ancestors into highly adapted and diverse population of local land races (Zewde, 2004).

According to (Buddenhagen and Richard, 1988; as cited by Zewde, 2004), domestication of wild species into cultivated crops has probably altered natural adaptation very little in the centre of origin. The migration of human populations and/or diffusion of crops from the centers of crop domestication exposed crops to new biophysical environments. The landraces, by disseminating into different agro-ecosystems, have acquired new genes or gene combinations and frequencies to fit into their new environments. Thus, farmers' selection coupled with natural selection conditioned the adaptation of landraces to their agro-ecosystems.

The history of seed trade is as old as agriculture itself. Farmers exchanged seed in various traditional forms such as gifts, barter, labor exchange or social obligations. However, information on when, where and how organized seed production and trade started, is limited. It is believed that the introduction of new crops and knowledge- based agriculture including scientific plant breeding, mechanization, intensification and commercialization at various stages of agricultural development might have played a key role (Zewde, 2004).

The informal seed system deals with small quantities of seed is semi-structured, operates at the individual farmer or community level and may depend on indigenous knowledge of

plant and seed selection, sourcing, retaining and management, as well as local diffusion mechanisms. The informal sector is more flexible and adaptable to changing local conditions and less dependent on or less influenced by other external factors (Cromwell *et al*; 1992).

The distribution of improved seeds to farmers started with the launching of the Chilalo Agricultural Development Unit (CADU) in 1967. In 1978 the Ethiopian Seed Enterprise (ESE) (formerly known as Ethiopian Seed Corporation) was established as a government parastatal under the now defunct Ministry of State Farms, Coffee and Tea Development. The primary objective of the enterprise was to produce and supply improved seeds to state farms and small farmers (Techane and Mulat, 1999).

2.5 The Ethiopian Government Agricultural Policy

Agriculture is the foundation of the national economy and plays a major role in the socio-economic development of the country. In 1991, the government launched the agricultural development- led industrialization strategy where emphasis is put on linking research with development through well-focused and targeted transfer of appropriate technology to farmers. The agricultural development strategy is aimed at promoting growth, reducing poverty and attaining food self-sufficiency while protecting the environment through safe use of improved technologies. The agricultural package program is spearheaded through demonstration and provision of improved varieties and required inputs such as improved seeds, fertilizers, and pesticides as well as better access to credit facilities (ICARDA *et al*, 1999).

Moreover, Agricultural Development Led Industrialization (ADLI) sets out agriculture as a primary stimulus to generate increased output, employment and income for the people, and as the springboard for the development of the other sectors of the economy. A 'green revolution'-like intensification of smallholder agriculture was seen as central by the government in implementing the strategy (Keeley and Scoones, 2000).

Policy makers assumed that significant productivity growth could be easily achieved by improving farmers' access to technologies which would narrow the gap between farmers' yield and what agronomists called 'exploitable yield potential'. Researchers also reported the existence of technologies that can make a huge difference and shift upwards farmers' yield frontier in grain production. Based on 6 years average data, researchers indicated that maize yield, for instance, can be increased from current farmers' yield level of 1.6 ton/ha to 4.7 ton/ha, and wheat from 1.1 ton/ha to 2.8 ton/ha and teff from 0.7 ton/ha to 1.5 ton/ha, if peasants use the right type and amount of improved seed varieties, fertilizers and other recommended practices (Berhane *et al*., 2004).

2.5.1Input sector reform and emerging market structure

2.5.1.2 The seed sub –sector

In 1992, the Transitional Government of Ethiopia (TGE) announced the National Seed Industry Policy (NSIP) with the aim of strengthening the supply of adequate and high quality seed. The policy envisaged the participation of both public and private enterprises in the production and marketing of improved seeds. The National Seed Industry Agency (NSIA) was also established in 1993 with the following objectives:

- To oversee and ensure that the seed industry develops and operates efficiently,
- To ensure that producers and the farming community, industries using agricultural raw materials and organizations which export agricultural products benefit from the seed industry,
- To create an enabling environment for capacity building in research development and training in the fields of genetic resources, conservation, crop improvement and seed technology.

In spite of the reform measures, the seed industry is still dominated by the ESE. Over 93% of the total seed supply came from the enterprise in 1996/97(Afri-Tech Consult,1998, as cited by Techane and Mulat,1999). The enterprise owns three basic seed farms (Iteya/Gonde,Arssi,262 ha),Shallo, the former East Shewa, currently West Arssi

zone 1870ha- 46.5% of which is currently under use and Kunzia, West Gojam, 500 ha). The Iteya basic seed farm represents the high lands for the production of mainly basic seeds of wheat, barley, tef, maize, faba bean , field pea, chick pea, lentil, rape seed, mustard, linseed and sunflower. Shallo and Kunzia are situated in mid –altitude and are used for the production of maize, sorghum, haricot bean, sunflower and tef. The ESE has also has five seed processing plants located at Asela, Kofele, Awassa, Nekemt and Bahir Dar (NSIA, 1999 as cited by Techane and Mulat, 1999).

According to NSIA (1999), the Ethiopian seed industry is characterized by the following deficiencies.

- Shortage of improved varieties and inadequate supply of high quality breeder and basic seeds which serve as the foundation for certified seed production;
- Inadequate specialized seed farms for different agro-ecological zones;
- Inadequate coverage of economically important crops and production regions;
- Absence of an organized system of using local cultivars;
- Inadequate provision for national seed data base and lack of provisions for reserve seed stock;
- Shortage of trained workforce in seed production, processing and marketing;
- Insufficient availability and supply of agricultural inputs mainly seeds and pesticides;
- No internal quarantine regulation to curtail the movement of seeds from contaminated area to another area;
- Inadequate follow up of imported materials by the quarantine unit of the ministry of agriculture.

2.5.1.1 The fertilizer sub- sector

The supply of yield enhancing inputs in Sub Saharan Africa (SSA) is restricted and highly priced in relation to international market prices. Within SSA, fertilizer use is mainly confined to export cash crops. Gregory and Bumb (2006) identified five pillars that are required to develop input markets and achieve market efficiency. Increasing supplies and market efficiency can reduce input prices. These five pillars are the policy environment; human capital development; access to finance; market information; and regulatory frame works. These generic components need to be adopted in the context of country-specific situations. Holistic improvements in all areas will reduce transaction costs and improve accessibility to fertilizers in rural areas.

Recognizing the need to increase the use of fertilizer, the federal Government of Ethiopia has taken several measures, including issuance of national fertilizer policy, liberalization of the market to allow private sector participation, deregulation of prices and expansion of extension services. The national fertilizer policy was issued in 1993 with the main aim of ensuring competitive fertilizer market and supporting the national fertilizer and extension systems. The Government completely deregulated fertilizer prices in 1998 and eliminated subsidy in 1997 in an attempt to create a fully competitive market (Techane and Mulat, 1999).

Despite the growth in the total fertilizer consumption, the average nutrient used per hectare of cultivated area in Ethiopia is one of lowest in the world. For instance, fertilizer nutrient use per hectare of cultivated land is about 48kg in Kenya, 97kg for the world (estimated average) and more than 200kg in Europe, compared to 17-20kg in Ethiopia. The picture of organic fertilizer is not any more encouraging. Because of fuel wood scarcity, rural households have been forced to divert animal dung from its traditional role as a source of soil nutrient to direct burning as a source of fuel (Ibid).

- **Fertilizer distribution channels**

Immediately after the liberalization, many wholesalers and retailers were registered as agents of different importers. For instance, in 1996 there were 2309 wholesalers and retailers registered by importers. But their number reduced to 430 in 1998 (quarterly reports of NFIA, 1996-1999). Field observations and regional reports have shown that the number of wholesalers and retailers further declined in 1999 (Ibid). This is because:

- Before the deregulation of fertilizer price, there was a retail margin built in the selling price of fertilizer fixed by the government. This margin has attracted many wholesalers and retailers to participate in fertilizer business. But, after complete deregulation, they have to compete in the market to earn profit. Many private wholesalers and retailers withdrew from the business doubting the profitability of this seasonal activity.
- Retailing by importers has also limited the number of private wholesalers and retailers, leaving no room for small wholesalers and retailers.
- Private wholesalers and retailers have also been discouraged by lack of working capital since most of them are not in a position to provide collateral to banks to get credit.

2.5.1.3 Agricultural input credit

Credit administration and channeling system varies from region to region. In Amhara, SNNP and Tigray, the regional governments actually assess loan requirement, screen eligible beneficiaries, process the loan applications and issue purchase order to the input supplies using the relevant administrative machinery. In such cases, the task of the bank is to distribute payments to the designated suppliers. Cooperative promotion bureau, Omo micro Financing Institute and ICU at different level are responsible for input credit administration. In Tigray, while the cooperative promotion bureau is responsible for administering input credit obtained from CBE, Dedebit Credit and Saving Institute deliver and administer input credit from its own fund. In Oromya region, the credit

required for the extension program is administered by the Agricultural Bureau at different levels. The agricultural bureaus assess loan requirement, process loan applications and issue purchase order to the suppliers. With regard to credit required for the regular program, the beneficiaries deal directly with the bank through their groups or service cooperative backed by the technical assistance from the cooperative promotion bureaus at different level (Ibid).

The regional governments use their administrative machinery at all level and apply administrative measures to enforce repayment. Although strenuous efforts are made by the regional governments to enforce repayments, loan recovery is still facing problems. Some of the factors constraining loan recovery are:

- Crop damage due to bad weather conditions
- Lack of integrated efforts among all concerned to collect overdue loans according to the time table
- Strategic default-decision by some farmers not to repay loans even they have the capacity to do so
- Some farmers are taking inputs and sell it in cash at a cheaper price to solve their immediate financial problems (Ibid).

2.6 Conceptual Frame Work of the Study

Agricultural input supply system has an immense contribution in enhancing the productivity of agricultural commodities through collective action of relevant actors within the system. The system also plays important roles in bridging modern agricultural technologies to the peasant sector.

Moreover, it has potential to influence goals, strategies and resources and thus bring about changes in policies, programs and other related agricultural projects. To insure food self sufficiency, identifying of influential factors in the smooth functioning of the system

is essential to design purposeful intervention planning for betterment of the farming community in particular and the society at large.

According to different sources and the real world situations, the input demand-supply system is influenced by personal, situational, economic, institutional and organizational factors. Therefore, in this study the researcher tries to analyze these relationships, identify the influence of independent variables on the dependent variable and also tries to identify the influential factors of the input demand-supply index of the area under study. The conceptual framework diagram of this study is presented in figure-1.

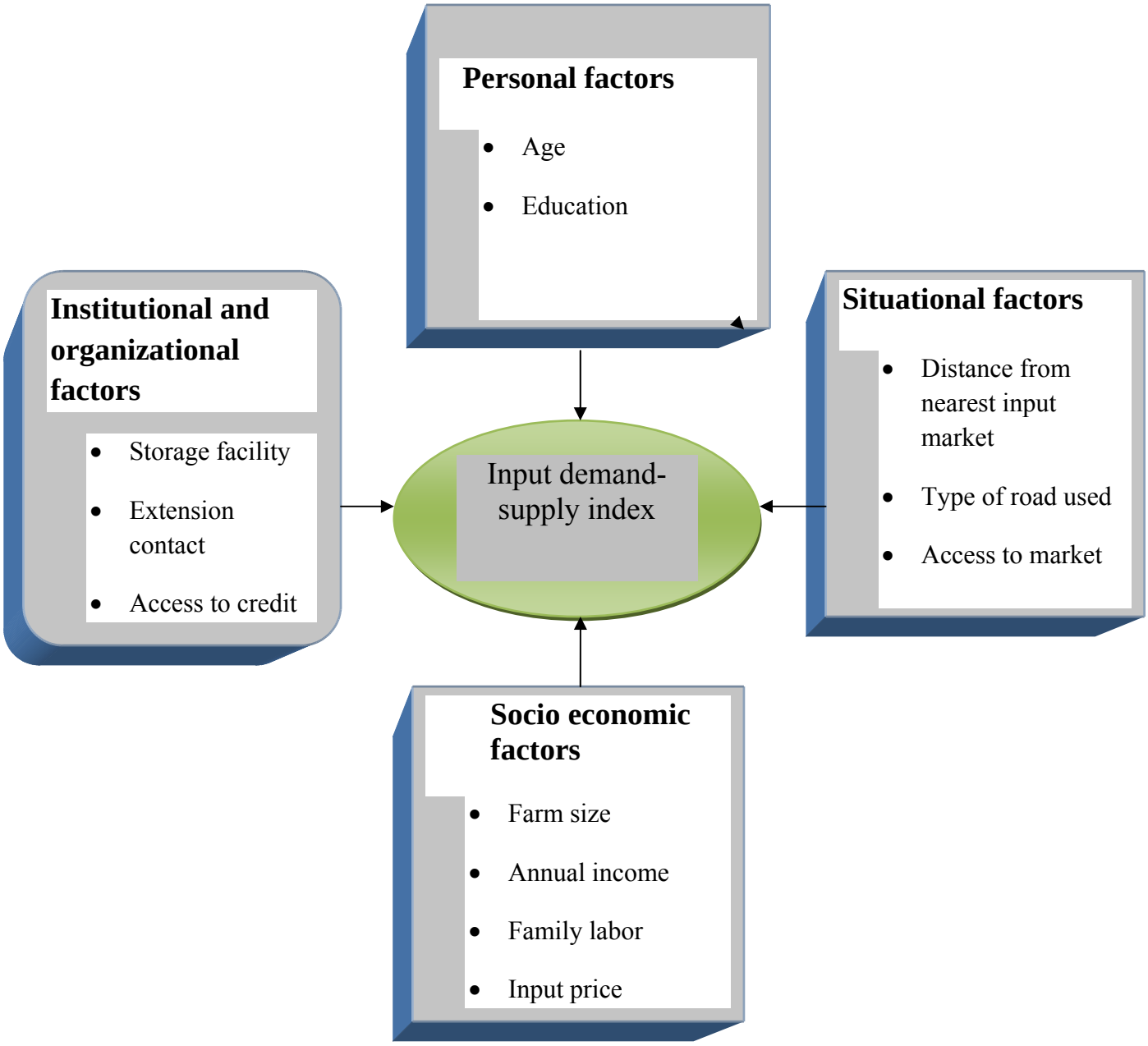

Figure 1: Conceptual framework of the input demand-supply index
Source: Own computation

3. METHODOLOGY

3.1. Description of the Study Area

Dale woreda is one of 19 Woredas in Sidama Zone and covers a total area of 28440 ha, at about 320 km south of Addis Ababa. The woreda is subdivided into 36 PAs. According to CSA (2008), the population of the woreda is estimated as 244692 of which women account for 49.7% and men account 50.3%of the population. The altitude of the woreda ranges from 1650-2800 masl. The altitude at Yirgalem, which is the woreda headquarter, is 1765 masl.

The mean annual rainfall recorded at Awada Research sub-centre in Yirgalem is 1314 mm. Rainfall declines as one move from the highlands in the east to lowlands in the west.

There are two cropping seasons in the area, *Belg* (short rainy season) from March to April and *Meher* (main rainy season) from June to September. *Belg* rains are mainly used for land preparation and planting long cycle crops such as maize and seedbed preparation for *Meher* crops. The *Meher* rains are used for planting of cereal crops like barley, *teff*, wheat and vegetable crops. *Meher* rains are also responsible for the growth and development of perennial crops such as *enset*, coffee and chat. Livestock also play a major role in crop production in areas of the mid highlands and lowlands for cereal production (draught power) in addition to meat and milk; it also denotes prestige and asset to the households.

Farming systems

According to IPMS (2005), two main farming systems can be found in Dale woreda. They are the garden coffee, *enset*, and livestock (here after referred to as coffee/livestock system) system is found east of the main road transecting Dale from north to south. The terrain is hilly and soils are red (Nitosols).

Rainfall is higher and more reliable than in the dry midlands haricot bean/livestock system. The farming system is composed of garden coffee, *enset*, and cattle, which are tethered and kept for manure and production of dairy products. Other crops in the system

are haricot beans (as an intercrop), yam, cereals, fruits, mainly avocado and bananas. Because of the perennial nature of the crop and the small holding size (between 0.25-0.5 ha per family), hand hoeing is the predominant method of cultivation.

The Cereals, *enset*, haricot beans, garden coffee, and livestock (here after referred to as haricot bean/livestock system) system is the other main farming system in Dale woreda. This system is found west of the road transecting Dale from North to South. The terrain varies from relatively flat to hilly. Black soils (Pellic Vertisols) are commonly found on the flat areas and red soils on the slopes. Rainfall is lower and more erratic than in the coffee system. This system is dominated by cereals (maize, *teff*) rotated with haricot beans. *Enset* is cultivated near the homesteads.

Garden coffee is grown in small patches, on the red soils. Extensive grazing areas are found, which are used for herding the oxen, cattle and goats. Average farm size is estimated at 1.5 ha. The farmers use oxen for their cultivation.

Besides these two major systems, one smaller system can be found in the extreme east at the high altitude where farmers grow horticultural crops like shallots (IPMS, 2005).

Crop Production

According to the available statistics, the area under coffee is 13,215 ha and average of 9 million kg of red cherry was sold annually to central market. Garden coffee improvement is being promoted predominantly in the coffee/livestock system. A total of 24 PAs have been targeted for this specialization, while, all the 36 PAs grown coffee. The commercialization of the haricot beans is targeted for the haricot bean/livestock farming system. The area under beans at the moment is still small i.e., 2,510 ha and the estimated production is 670 tons. A total of 12 PAs are targeted for specialization. The government intends to commercialize the haricot bean for export purposes, using the Awash 1and Awash melka varieties (small white seeds). This is a new introduction to the area which can either be added to and/or replace the area already sown with the local red Wolayta

variety (IPMS, 2005). According to WARDO, the total coverage of maize crop is 3007ha.

Table 1: Types of major crops grown and coverage in ha

S.No	Type of crops	Coverage in ha
1	Coffee	13215
2	*Enset*	9021
3	Maize	3007
4	Haricot bean	2510
5	Mango, Avocado &Banana	496

Source: WARDO, 2009

Livestock

The main livestock species in the woreda are cattle, goats and sheep. The livestock resources are cattle 126459; sheep 19319; Goats 13352; Poultry 109,452; Horses 136; Mules 68; Donkeys 3991; and Beehives 6777. Production systems range from extensive system in the lowlands (haricot bean/livestock system) to intensive tethered system in the major coffee/livestock system. Sheep production is important in the *Dega* (highlands) areas. Cattle, sheep and goat production is major in the mid-altitudes and goat, cattle, and sheep production are important in the lowland areas. Land preparation is mainly done by oxen power in the haricot bean/livestock system or human power using hoe in the coffee/livestock, depending on land size and availability of oxen. Oxen ownership is very low and farmers share their oxen for ploughing. In the woreda, only 16% of the farmers have a pair of oxen, 26% have one ox and 58% have no oxen. There is a large resource of production of skins and hides in the woreda. Production of fattened cattle, goat and sheep has great potential and there is a plan to enhance meat production in the woreda. The poultry production system is traditional using local birds. The market-led priority livestock commodities incorporated in the woreda development plan are: 1. Dairy Production 2. Meat production from fattened ruminants (mainly cattle and goats). 3.

Skins and Hides 4. Poultry production. Apiculture is identified as a potential commodity for development (IPMS, 2005).

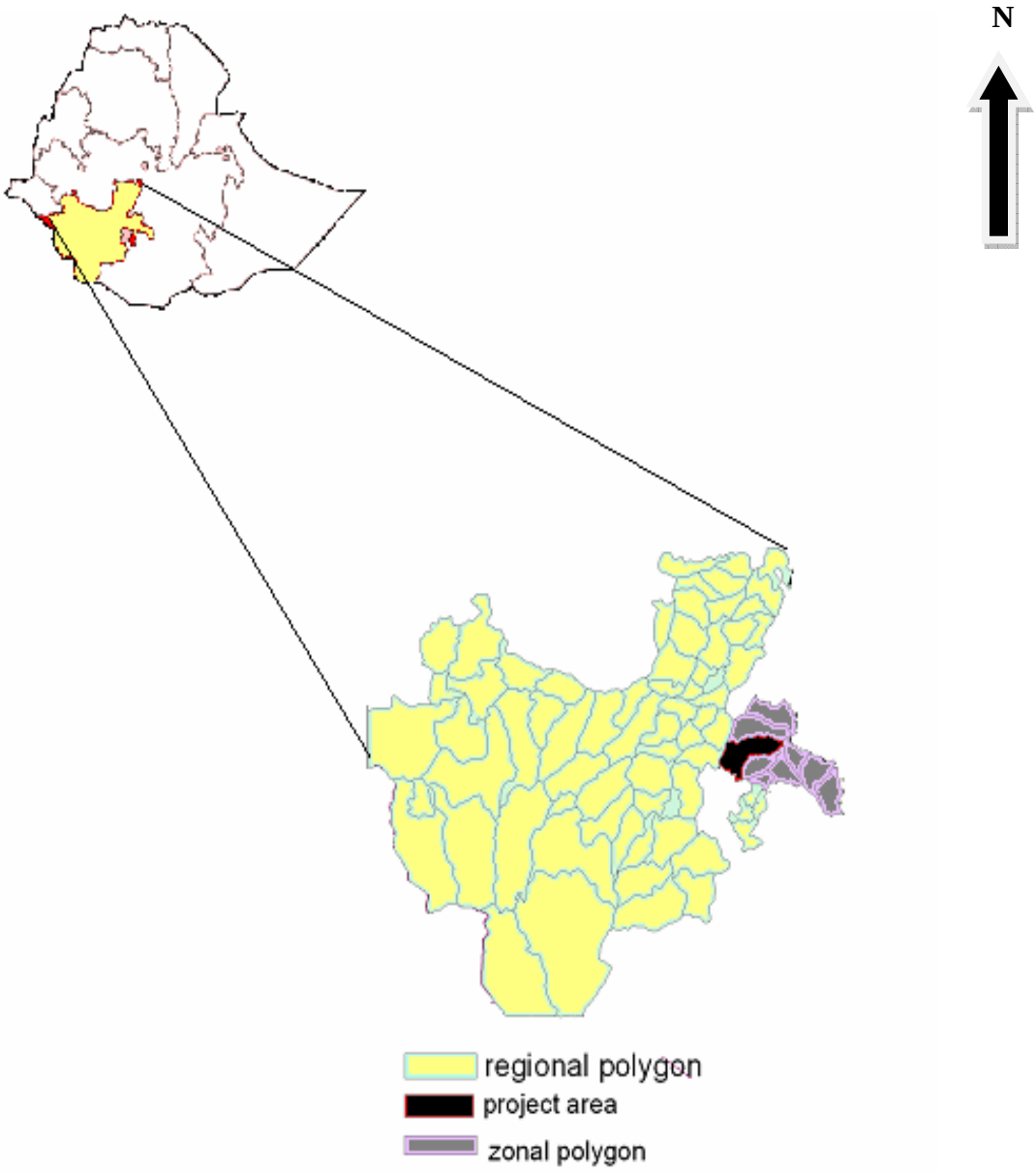

Figure 2: Location of the study area

3.2 Sampling Techniques

To develop sampling frame for the study, both probability and non-probability sampling methods were used. Multi-stage random sampling from probability sampling techniques and convenience sampling technique from non- probability sampling were used.

Firstly, the woreda was divided into two groups according to the existing farming system (coffee-livestock and haricot bean-livestock). From two farming systems, PAs were stratified depending on closeness and farness from the center (town). Then a total of four PAs were selected purposively (two from far and two from closer to town). Finally respondents were randomly selected using probability proportional to size (PPS) in terms of the population density of the selected PAs.

Sample size is determined based on research time and resource available and accordingly the total size of the respondents was 200 farmers. Female-headed HHs in the selected PAs were included in the sample with proportion of 20% for their engagement in crop production processes.

Table 2: Distribution of sampled respondents by PAs in the study area, Dale woreda, 2009.

S.No.	Name of PA	Total number of HHs	Number of respondents in the sample			
			No. Male HHs	No. Female HHs	Total	Farming system
1	Shoye	1240	46	9	55	Coffee-livestock
2	Manche	990	33	10	43	» »
3	Debub mesinkella	852	29	10	39	H.bean- livestock
4	Danshe sire	1411	52	11	63	» »
	Total	4493	160	40	200	

Source: own survey, 2009.

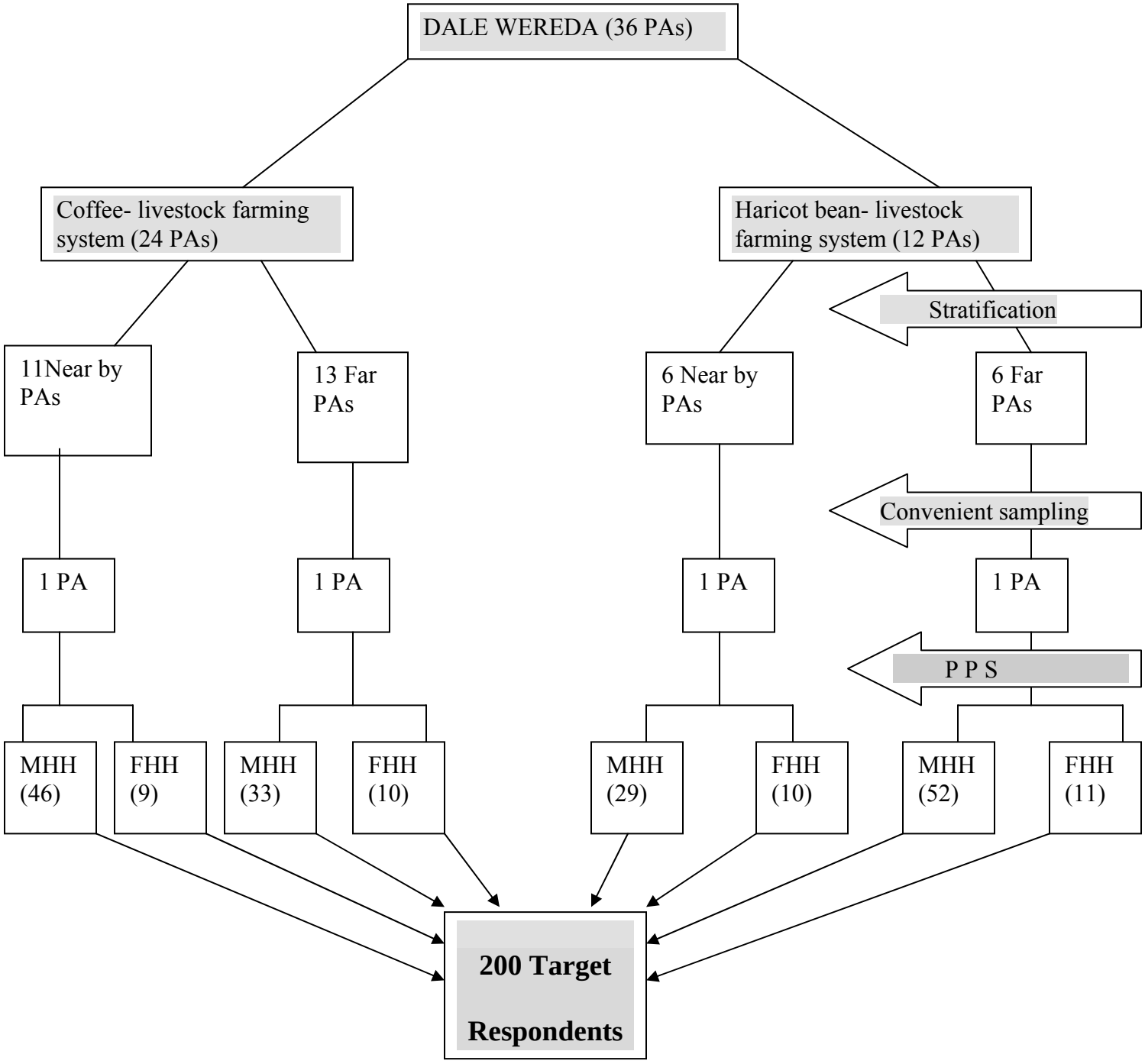

Figure 3: Sampling procedure of the study

3.3 Method of Data Collection

The primary data necessary for the study were collected from sample respondents by using pre-tested and structured interview schedule.

For the purpose of data collection, 10 enumerators, who have acquaintance with socio economic concepts and knowledge of the culture of the society as well as local language proficiency were selected, oriented and employed.

The interview schedule was consisted different types of questions or items, related to the topic of the research and relevant variables to gather the needed information. Thus structured interview schedule was developed and used in order to allow the respondents to freely express their opinion on issues related to the research topic. After formulating the interview schedules, necessary editing was done for its observed consistency and logical sequence with frame of reference of the respondents. Then it was subjected to a pilot study on non-sample respondents with a minimum and adequate sample size. Based on the nature and extent of responses obtained, necessary modifications and further editing was done in the interview schedules to ensure its clarity and completeness for generating the needed information from the respondents. As to input/service providers, data were collected through questionnaires distributed to relevant actors related to the research topic.

To supplement the quantitative data, qualitative data was collected through focused group discussions, informal interview with key informants, discussions with woreda level and village level extension staff and related actors.

To collect data on information/knowledge flow, Rapid Appraisal of Agricultural knowledge systems (RAAKS); information source-use exercise (Tool B3/a) and linkage matrix (Tool B4/a) were used. These tools help to identify the important types of information and knowledge, the source and users of knowledge and information, the

intermediaries that move knowledge and information and the status of linkage among actors (Salomon and Engle, 1997).

3.4 Method of Data Analysis

Different types of analytical methods can be used to evaluate different research results and make a sound conclusion for a given survey information. Literature reveals that each and every analytical method has their advantages and limitations; it is always advisable to select the one that can better suit to answer the specific purpose (Hopkins *et al*., 1996; Pallant, 2001).

The role of statistics in research is to function as a tool in analyzing its data and drawing conclusions there from. Only after this, we can adopt the process of generalization from small groups (i.e., sample) to population.

In this study, data were analyzed using different quantitative and qualitative procedures and methods. Descriptive statistical tools were used to analyze the quantitative data. The important statistical measures that were used to summarize and categorize the research data were means, percentages and frequencies. Qualitative assessment was carried out using key informants and focused group discussion; input suppliers' survey and government policy document content analysis.

To see the association of explanatory variables with response variable chi square test for discrete/categorical variables, Pearson correlation analysis for continuous variables and Spearman's rho correlation analysis for dummy variables were used.

Multiple Linear Regression (MLR) analysis was another statistical technique used to analyze the influence among variables (*i.e.* single dependent variable and several independent variables) with the object of using the independent variables whose values are known to predict the single dependent value (Hair *et al*., 1998).

According to Browen and Starr (1983), the regression equation takes the form:

$$y = a + b_1x_1 + b_2x_2 + b_3x_3 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots + b_p x_p + e_i$$

Where:

y = Dependent variable

x = Independent variable (of there are p)

a = y intercept

b = the slope of the line

e_i = error term

Estimation procedure

Following the completion of the data collection, the responses were coded and entered into SPSS version 12.0 for analysis.

Before estimating the models, it was necessary to check if multicollinearity exists among the explanatory variables. If multicollinearity turns out to be significant, the simultaneous presence of the two variables will reinforce the individual effects of these variables.

According to Gujarati (1995) there are various indicators of multicollinearity and no single diagnostic will give us a complete handle over the collinearity problem. For this particular study, Variance Inflation Factor (VIF) was used for continuous variables.

The larger the value of VIF, the more it is troublesome. As a rule of thumb, if the VIF of a variable exceeds 10 (this will happen if R_i^2 exceeds 0.95), that variable is said to be highly collinear (Gujarati, 1995). Following Gujarati (1995), the VIF is given as:

$$\text{VIF}(X_j) = \frac{1}{1 - R_j^2}$$

Where, R_j^2 is the coefficient of determination when the variable X_j is regressed on the other explanatory variables.

Similarly, there may be also interaction between qualitative variables, which can lead to the problem of multicollinearity. To detect this problem, coefficients of contingency were compounded. The contingency coefficient was compounded as follows:

$$C = \sqrt{\frac{\chi^2}{n+\chi^2}}$$

Where, C is coefficient of contingency, χ^2 is chi-square test and n = total sample size. For dummy variables if the value of contingency coefficient is greater than 0.75, the variable is said to be collinear (Healy, 1984 as cited by Mesfin, 2005).

3.5 Definition of Variables and Working Hypotheses

3.5.1 Dependent variable

Dependent variable of the study is agricultural inputs demand-supply index. The variable would operationalzed as farmers' response in terms of the quantity of required and obtained inputs on the selected crops. It was measured using demand-supply index of the respondents with structured list of items selected.

$$IDSI = \frac{S_x A/D_x A + S_x B/D_x B + S_x C/D_x C + S_y A/D_y A + S_y B/D_y B + S_y C/D_y C\ldots\ldots\ldots\ldots..}{N}$$

Where:

IDSI = Input demand supply index

S= quantity of inputs supplied

D= quantity of inputs demanded

A, B, C = Crops (Coffee, Haricot bean and Maize)

x,y ……..= are types of inputs

N = number of inputs applicable

3.5.2 Independent variables

For this study, 12 independent variables were hypothesized to influence the dependent variable. Out of these variables; five, three and four were continuous, discrete/categorical and dummy respectively. Independent variables include the personal/demographic, socio-economic, situational, and organizational and institutional factors that may influence the dependent variable. The selection of independent variables is based on the past research and published literature related to the study.

1. Age- the age of the farmer has negative effect on using agricultural inputs by contributing for risk aversion (Abadi and Pannel, 1999). It is hypothesized that as the age of the farmer increases the demand for agricultural inputs will be decrease. Thus it was expected to have negative effect on the dependent variable. It was measured in year's equivalent.

2. Educational level- the level of formal education of the farmer is important variable affecting the probability of using improved agricultural inputs (Nkonya *et al*., 1997). The better the education level the farmer has the better will be his understanding concerning the knowledge of improved agricultural technologies. Thus educational level was assumed to have positive association with dependent variable. It was measured using categorical scale.

3. **Family labor**- a farmer with larger number of family size engaged on agricultural activities is more likely to be in a position to try to continue using a potentially profitable production enhancing inputs (Abadi and Pannel, 1999). Thus a farmer with high family labor will have a capacity to use labor intensive agricultural inputs. The variable was expected to have positive effect on the demand-supply of inputs. It was measured by man equivalent.

4. Access to credit - the existence of credit institution at a disposal of farmers will enhance the use of improved agricultural inputs. A study conducted by Getahun *et al.*, (2000) revealed that access to credit, has a significant and positive influence on the

adoption of improved technology. Therefore, the variable was expected to have positive effect on the dependent variable. It was dummy variable with value of 1 for yes and 0 other wise.

5. **Storage facility-** the presence of storage for agricultural inputs at farmers' disposal may encourage farmers to demand it timely. Thus it was assumed to have positive relation to the dependent variable. It was dummy variable with value of 1 for yes and 0 other wise.

6. Extension contact - the more contact the farmer has with extension service, the more will be the information/knowledge s/he has and the better will be the use of agricultural inputs (Haji, 2003). Packages developed by Board are more or less composed of improved agricultural inputs. DAs are responsible to transfer knowledge about the recommended packages prior implementation through their regular contact program. Therefore, it is assumed that farmers who have frequent contact with DAs are more likely to demand agricultural inputs due to the increased awareness, and it was expected to affect the dependent variable positively. It was measured using different levels of frequency scales.

7. Type of road used- limited infrastructure development influences the production and distribution of agricultural inputs, because of high transportation and marketing cost (Tesfaye and Shiferaw, 2001). The type of road used for agricultural inputs delivery may influence the availability of inputs at farmers' disposal. There fore the variable expected to influence the dependent variable negatively. It was discrete variable measured 0 for absence, 1for all weathered and 2 for winter season road.

8. Distance from nearest input market- Distance to market is negatively associated with the use of production enhancing inputs. Those who are far from the market may not have a chance to get agricultural inputs comparing to the nearby farmers (Legesse, 2001). Therefore, the variable was expected to have negative association with the dependent variable. It was measured in kms.

9. Farm size- the size of land holding to a limit of course provides sufficient income and there by funds for investment on modern farm inputs (Roy et al., 1999). Thus size of land holding assumed to have positive relation to dependent variable. It was measured in 'timad' base and hactar equivalent (4 timad= 1 ha).

10. Annual income - the status of the farmers in terms of their annual income will matter in deciding to purchase improved agricultural inputs. Wealthy farmers decide to take risk for using agricultural inputs (Getahun, 2004). Therefore, annual income has assumed to have positive relation to dependent variable. It was measured in Ethiopian birr.

11. Access to market- Market access is one of the variables that affect input out put marketing in rural areas. Presence of input/output marketing at farmers disposal would increase the uptake of improved agricultural inputs by farmers. Hence the variable was expected to have positive influence on the dependent variable. It was dummy variable with value of 1 for yes and 0 other wise.

12. Input price- the price of agricultural inputs may encourage/discourage farmers in order to use production enhancing inputs. Wolday (1999) indicated that price of inputs is significantly related to use of improved seeds. If the pricing regulation of inputs does not invite farmers, it will have negative effect on improved agricultural inputs use. Therefore, this variable was expected to have negative association with the dependent variable. It was dummy variable with value of 1 for yes and 0 other wise.

4. RESULT AND DISCUSSION

This part of the thesis presents the major findings of the study under three sub sections. The first sub section presents map of actors, linkage and knowledge flow within the input demand-supply system in the study area. The second describes influential factors for the smooth functioning of the system. The implication of current input/service delivery system is analyzed from the perspective of Government policies and institutional arrangements in the third subsection.

4.1 Actors Mapping, Linkage and Knowledge Flow within the System

4.1.1 Actors mapping

To map the actors, discussions were made with WARDO staff and farmers in the study area. According to the survey result, actors involved in the woreda are mainly concerned with technology generation, promotion, input supply and knowledge transfer to farmers. From the result of the discussion; WARDO, Woreda Cabinet, Sidama Zone Agriculture and Rural Development Department (SZARDD) Hawassa Agricultural Research Center (HARC), Awada Coffee Research Sub Center (ACRSC), Sidama Elto Cooperatives Crop Union (SECCU), Ethiopian Seed Enterprise- Hawassa Shallo Basic Seed Multiplication Company(ESE-HSSMC), Coffee seed multiplier farmers and Improving productivity and market success of Ethiopian Farmers (IPMS) are identified as main actors currently involved in different intervention areas of the woreda in relation to agricultural input supply system . Actors who are assumed to have indirect involvement in the system are identified as missed actors viz. Bureau of agriculture and Rural Development (BoARD), Pioneer Hi- Bred Seeds Ethiopia P.L.C and Agricultural Input Supply Enterprise (AISE). Identified actors and their role in the system are illustrated in Appendix Table 6.

Role of actors in the study area

- **Woreda Agriculture and Rural Development Office (WARDO)**

WARDO is mainly concerned with provision of extension service to farmers through woreda SMSs, and DAs assigned in each PA who are responsible to transfer knowledge about plant production, animal production and natural resource conservation and development using individual and group contact. It is also engaged in facilitation and joint action of activities carried out by partners such as input suppliers, GO and NGOs for the successful accomplishment of their goals and objectives towards improving the livelihood status of farmers in the project area. Moreover, with regard to agricultural input provision, farmers demand would be finalized through DAs and line work process for the timely delivery of inputs.

- **Woreda cabinet**

In input demand-supply system, the woreda cabinet has played significant role in mobilizing farmers for rural development activities. It facilitates joint actions such as input supply, input credit provision and monitoring and evaluation of productive safety net activities.

- **Sidama Zone Agriculture and Rural Development (SZARD)**

The Sidama Zone Agriculture and Rural development Department is concerned with all activities undertaken in the study woreda by line sector office. The department played role in facilitating input credit, input distribution, technical assistance, and monitoring and evaluation of the extension program. It is also involved on capacity building to SMSs and farmers through workshops and refreshment trainings.

- **Hawassa Agricultural Research Center (HARC)**

As it is well known that agricultural inputs specially seed technologies are the result of research organizations', efforts have been made to maximize the production and productivity of seed technologies per unit area. In the context of this approach, HARC

played significant role in execution of enormous types of seed technologies which are best fitted to different agro- ecological zones.

In the study area, the research organization has provided different types of haricot bean varieties to be selected by farmers. It also works with IPMS to strengthen farmers to farmers seed exchange system. As a member of Research Extension and Farmers Linkage Advisory Council (REFLAC), the organization started to strengthen the linkage with WARDO and farmers in transferring knowledge through Farmers Research and Extension Groups (FREG).

- **Awada Research Sub Center (AWRSC)**

The research sub center is working under close supervision of Jimma Coffee Research Center. The main occupation of the research station is to conduct research on coffee and diversification with associated crops. The research station provides coffee berry disease (CBD) resistant improved coffee technologies to farmers and in return works for the improvement of the technologies on feedback gained from users. Currently, dissemination of "Angefa" improved coffee variety is on duty in collaboration with IPMS and WARDO staff for coffee multipliers and growers.

- **Sidama Elto Cooperatives Crop Union (SECCU)**

The Sidama Elto Crop Cooperative Union is one of the three unions existing in Sidama Zone. The main occupation of the union is supplying inputs to farmers through member cooperatives/WARDO to farmers and facilitation of market link for grain produce to its primary member cooperatives. As to input supply, the union is mainly concerned with provision of commercial fertilizer from Federations at regional level to farmers grass root level on credit and cash bases.

According to a key informant of the organization, the input delivery system is not efficient as expected. This is because, the organization lacks warehouses, trucks and vehicles to damp inputs at farmers disposal, transport inputs for distant areas and to

facilitate input delivery system with concerned parties respectively. However, to reverse the situation, the organization tried to deliver inputs through cooperation with public line sectors.

- **Ethiopian Seed Enterprise- Hawassa Shallo Basic Seed Multiplication Company(ESE-HS)**

The main occupation of the organization is seed multiplication, processing and distribution. Maize hybrid varieties (BH-540, BH-660 & BH-140) and haricot bean varieties (Red wolita, Awash melka, Awash-1, Ebado, etc.) are supplied from this enterprise to farmers in the study area. Besides these, variety adaptation trial is carried out in conjunction with WARDO to provide inputs that best suited to the agro ecology of the woreda. However, the organization could not satisfy the need/ demand for improved hybrid maize varieties due to lack of irrigable seed multiplication farm and related constraints (see appendix table 3). As the organization is a member of the regional REFLAC, the advisory council arranges quarter and yearly meetings, forums and workshops in collaboration with Rural Capacity Building Project (RCBP) to share knowledge among member partners. ESE/HS being as improved seed supplier shares its experience and get feedbacks from line sector representatives to improve the seed multiplication process.

- **Coffee seed multiplier farmers**

Farmers, who are living in one of the woreda PAs (Dagiya), are engaged in coffee seedling multiplication in addition to crop production and livestock rearing. These farmers started coffee seedling multiplication eight years ago in small patches near river side. They were supported by WARDO in provision of coffee berry disease (CBD) resistant improved coffee seedlings/seeds. Now-a-days, multipliers have started to provide coffee seedlings and seeds to surrounding farmers and coffee growing zones of the region respectively.

Though they are working with close technical assistance of WARDO and IPMS, according to the key informants, due attention is not given by responsible bodies to

empower them. They need to be organized in group or association to broaden their activities and enhance bargaining power in competitive markets.

- **Improving productivity and market success of Ethiopian Farmers (IPMS)**

The role of IPMS in the study area is not limited with research and development. It also involved in capacity building activities through conducting trainings in collaboration with WARDO and research organizations to SMSs, DAs and farmers groups to bring about sustainable agricultural development in the sector. Besides this the project facilitates market links and input supply for high value agricultural commodities like; coffee, haricot bean, mango and avocado through joint action with concerned parties. It also accessed knowledge centers as a source of indigenous and scientific knowledge to users in woreda and PA level. Currently provision of selected varieties of haricot bean and coffee to targeted farmers group is underway with the collaborative actors of IPMS.

Missed actors

In the process of actor identification through FGD, key informants and relevant staff of WARDO, some missed actors were identified. These actors have their own contribution for the system either by playing facilitation role or indirect involvement. The identified missed actors were Regional Bureau of Agriculture and Rural Development, Pioneer hybrid P.L.C and AISE. The roles of these actors in the system are discussed below.

- **Bureau of Agriculture and Rural Development (BoARD)**

The regional BoARD has direct involvement in input credit facilitation. The loan agreement modality document is signed in collaboration of this organization with loan lender banks and responsible line sectors. In addition to this, capacity building activities are conducted to woreda SMSs and DAs through TOT and refreshment trainings. The SMSs of BoARD are also provided technical support to woreda SMSs to bring about change within the sector.

- **Pioneer Hi-Bred Seeds Ethiopia P.L.C**

Pioneer hybrid is the first private company that provides hybrid maize seed in the country. Few years ago farmers in the study area were using hybrid corn varieties namely Phb- 3435 and Phb- 3253. But now due to shortage of improved hybrid maize seeds, farmers could not get the seed. According to the company key informant, timely claim is very important to get hybrid corn seeds. They also need to re-strengthen their linkage with the WARDO to serve as alternative seed source.

- **Agricultural Input Supply Enterprise (AISE)**

The former AISCO and the now AISE is the government enterprise known for a long period of time in delivering commercial fertilizer to farmers throughout the country. Farmers in the study area were also using DAP and UREA fertilizers from the distribution centers. According to the key informants of the enterprise, though due to the illegal interference of some actors in the bid process, the enterprise was not able to reach the farmers, still they are willing to work with the community as alternative source of commercial fertilizers.

4.1.2 Linkage

According to Hagmann *et al*., (2002), linkages between service providers in to service delivery system are critical to 'make the system work as a system'. The different roles and mandates of service providers need to be clarified and even more important; they need to 'learn to play the roles' and work together in synergistic way towards making a difference.

To bring sustainable agricultural development, partners within the sector must develop joint collaborative action to ensure efficient and effective input/service delivery system. To support actors in the sector, the Regional Research Extension Farmers Linkage Advisory Council (REFLAC) started to strengthen the linkage among multiple actors. Potential actors like BoARD, Research stations and FREG are participated in joint planning for action. The main aim of the council is to promote farmers participatory

research through strong collaborative action by potential actors and to develop area specific technologies through adaptation trials and farmers- to- farmers seed exchange specifically on cereal and pulse crops. The Regional Rural Capacity Building Project (RCBP) is in charge of facilitating joint activities carried out by partners through budget and material support i.e. capacity building , workshops, joint monitoring and evaluations, for members of advisory council and FREG. In the study area, linkage of actors is worked out on the basis of their proximity to the farmers and link for support among themselves.

4.1.2.1 Linkage of actors with farmers in the project area

Actor interaction is mapped using both character based map and linkage matrix. By using character based map; here we can look at individual actors and see that they link up with. Following Anandajayasekeram *et al.*(2008) the actor linkage maps were produced by placing farmers in the center and linking the other actors based on their contribution to the demand sector (farmers). A participatory actor's linkage map was produced by farmers and other key informants according to the proximities to them and farmers and key informants were asked to identify key actors they have linkage and draw the map (Figure 4).

As indicated in the linkage map, farmers and key informants put the linkage between them and actors as strong with WARDO, Wereda Cabinet and coffee seed/seedling supply farmers. On the other hand, they put medium for the linkage with, SZARDD, IPMS and Awada Research Sub Center (ARSC). Lastly, they put weak linkage with Hawassa agricultural research center, Sidama Elto Crop Union and Ethiopia Seed Enterprise/ Hawassa Shallo. The probable reason for this is actors who are involved in input/ service provision prefer to communicate facilitators rather than farmers even if there is room to communicate.

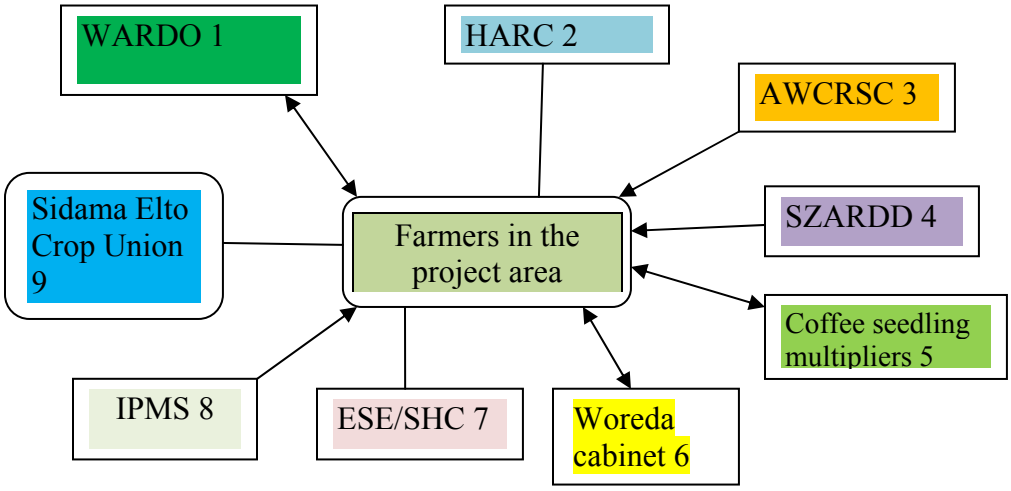

Figure 4: Actors' linkage map developed by FGD and key informants

Key:
Linkage strength

Strong linkage

Medium linkage

Weak Linkage

Linkage description

1. Extension service, farmer's mobilization, input distribution
2. Adaptation trial, demonstration of improved technology
3. Provision of improved coffee technology
4. Technical support and facilitation of input supply
5. Improved coffee seedling/seed supply
6. Mobilization and administrative support
7. Maize and haricot bean seed supply
8. Technical support, training, haricot bean seed and coffee seed support, and market link
9. DAP and UREA fertilizer supply

4.1.2.2 Linkage among actors in the input demand-supply system

The advantage of linkage matrix over linkage map is it helps to show the linkage and interaction among the different actors (Anandajayasekaram *et al.,* 2008). Thus, actor

interaction was presented using linkage matrix where major actors in the input demand-supply system are listed both the row and column of the matrix and their relation and interaction is described in the intersection cells (Table 3). Each box/cell in the matrix then represents the linkage between the two actors and the type of linkage. Bolded cells represent strong linkage among the respective actors.

Accordingly strong linkage was observed between actors involved in technology generation and knowledge provision viz. HARC, AWCRSC, SZARD, WARDO and IPMS. The probable reason for this might be the presence of these actors in different plat forms such as REFLAC may contribute to act collectively for joint actions. In contrary, the linkage between others seems to be weak. These weak interactions call for strong efforts to strengthen the capacities of relevant actors for interacting and learning.

Table 3: Actor's linkage matrix in Input demand-supply system

ACTORS	WARDO	SZARDD	Woreda cabinet	HARC	AWRSC	SECU	Farmers in the project area	ESE/HASH	Coffee seed multiplier Frs.	IPMS
WARDO		**Technical support and facilitation of improved agricultural inputs delivery**	**Facilitation and administrative support**	**Technical and administrative support for improved seed technology introduction and promotion**	**Technical support and feedback on introduction and promotion of improved coffee techno.**	**- Distribution of inputs - information sharing on feedbacks and demand claims**	**- provision of extension service - input Distribution - Farmers mobilization**	- input supply - variety Demonstration	**Technical support and coffee seedling distribution**	**- joint planning - group formation and training**
SZARDD			**Technical and administrative support**	**Technical and improved techno support**	**Technical and improved techno support**	**Technical and facilitation support**	- technical and input facilitation support	**- technical and facilitation support**	Technical and facilitation support	**Technical and facilitation support**
Woreda cabinet				**Nil**	**Nil**	Facilitation & administrative support	**Facilitation, mobilization & administrative supp**	**Nil**	Facilitation & administrative support	**Technical and administrative support**
HARC					**Collaborative work on coffee technology**	Technical and material support	Demonstration of improved technology - feed backs	Provision of parental materials for seed multiplication	Nil	**Collaborative work on transfer of knowledge**
AWRSC						Nil	Provision of improved coffee technology	Nil	Product testing on farm variety trial	**- Joint planning - improved coffee technology support**
SECU							Inputs supply through WARDO	Improved seed support	Nil	Nil
Farmers in the project area								Variety demonstration	**Coffee seedling provision**	**- training - market linkage - technical support**
ESE/HSH									Nill	Nil
Coffee seed multiplier farmers										**Input and technical support**
IPMS										

Source: Own survey result, 2009.

Case study 1

Limassa Rikiwa is a member of coffee seed/seedling multiplier farmers' group of Dagiya PA. He told us about market link problem he faced. He said, "I have started coffee seedling multiplication eight years ago near river side in small scale and now I broaden the activity and started to earn 10000 birr per year. Thanks for WARDO experts, due to their serious supervision and technical support, now some forty farmers have adopted it and started to provide seedlings to surrounding farmers. Moreover, last year we have started preparing different coffee seed varieties (1377, 74110, and 74112) by the order of BoARD via WARDO for zones like Kembata and Tembaro, Wolita and Dawro. I am working with my relatives and we are ten in the group and promise to produce coffee seed. As per the agreement, we produced 991 kg of seed on time. But the problem came, when these mentioned zones of the region ignore to take as per schedule. As we have incurred costs to prepare the seed, they must settle the necessary requirements timely and receive the seed. But after suffering a lot, WARDO and Sidama Zone Agriculture and Rural Development Department (SZARDD) helped us in finding market for the seeds produced. Though we are in a position to produce seed for multiplication purpose, the link between market and our group is very poor. Therefore, attention has to be given to organize us in cooperative association to enhance our bargaining power as well as to create effective linkage with partners".

4.1.3 Knowledge flow

Knowledge /information flow of the system is studied on the basis of the type of knowledge/information delivered by each actor. From the survey result, actors who involved in delivering technical, strategic, operational, policy and market information are identified using operational definitions for each type of knowledge/information delivered. Table-4 shows that matrix of sources of knowledge/information delivered to each actor in the study area.

Table 4: Matrix of sources of knowledge/information delivered to each actor

S.No.	Name of actors	Sources of knowledge/ information delivered				
		Technical	Strategic	Operational	Policy	Market
1	Hawassa RC	4,7	-	-	-	-
2	Awada RC	1	-	-	-	-
3	Sidama ECU	-	-	-	-	4,7
4	WARDO	1,2,5,7	1,2,5,6,7	1,2,5,7	6,7	1,5,6&7
5	IPMS	1,2,7	-	1,2	-	-
6	Woreda cabinet	4,7	-	4,7,9,10	-	4,5,7
7	SZARDD	1,2,8	1,2,4	1,2,8	-	4,5
8	ESE/SHC	1,4	1	1	-	4,7
9	Coffee seedling supplier farmers	4,5	-	4,5	-	7
10	Famers in the project area	4,5	4,6	4	4,6	4,5,6

Source: Own survey 2009

Operational definitions for the above matrix

Technical: Knowledge/information related to technology to be utilized (e.g. merit of improved varieties, how to control pests.etc)

Strategic: Knowledge/information related to future perspectives (e.g. keeping up of quality standards of coffee for export, improving productivity for better income, cost benefit analysis etc.

Operational: Knowledge/information related to activities to be under taken (e.g. adjusting planting time, use of short duration varieties to escape from drought, plant population per unit area and such managerial aspects.

Policy: Knowledge/information related to policy issues like organizing farmers for better market negotiations, channelizing incentives.

Market: Knowledge/information related to in the context of input-output marketing to benefit the farmers.

From the above matrix, actors like WARDO, Woreda cabinet and SZARDD are found to be relatively with different sources of knowledge/information that would help in achieving their plan of actions. The probable reason for this is knowledge/information related to technical, operational and market would provide by multiple actors to strengthen the overall agricultural extension program to the study woreda in particular and Sidama zone in general.

Linkage between actors could be seen through how they frequently communicate and draw active knowledge/information flow mechanisms to end users. In the study area, frequency of knowledge flow among actors is also identified according to how frequent knowledge transferred to end users. Table-5 shows frequency of knowledge flow within the system.

Table 5: Frequency of knowledge flow within the system

S.No.	Name of actors	Frequency of knowledge flow		
		Frequently	Sometimes	Rarely
1	Hawassa RC		X	
2	Awada RC		X	
3	Sidama ECU			X
4	WARDO	X		
5	SZARDD		X	
6	Woreda cabinet		X	
7	IPMS		X	
8	ASE		X	
9	Coffee seedling supplier farmers		X	
10	Farmers		X	

Source: Own survey 2009

From the survey result, frequency of knowledge flow within the system is not as such satisfactory due to absence of strong linkage among all actors. The probable reason for this is actors who involved in the system are not transferring knowledge to farmers directly rather they transfer to WARDO independently. Therefore, WARDO might shoulder all responsibilities to transfer knowledge delivered by partners to farming community and feedbacks from the farmers to partners. The study revealed that knowledge flow between partners and WARDO is relatively frequent.

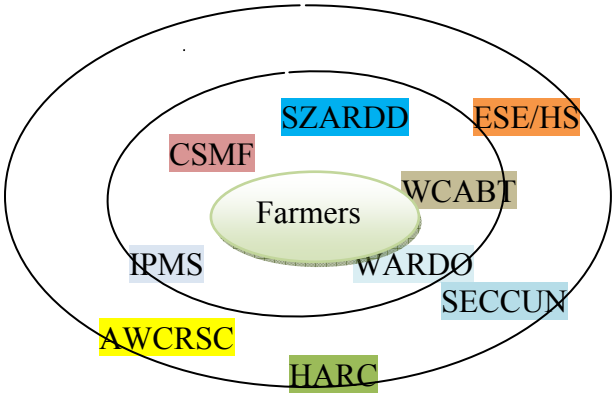

Figure 5: Position of actors drown to show their closeness to farmers in knowledge flow

4.1.4 Constraints of input demand-supply system

Constraints of the system were identified from the perspective of input/service providers and users independently. Questionnaires and interview schedules were used to collect the data from input/service providers and users respectively. The results of the survey are discussed below.

Constraints of input/service providers

According to key informants and input/service suppliers survey result, the following are constraints of the supply sector.

- Unavailability of agricultural inputs at farmers disposal due to lack of transport, storage, etc. facilities

- Lack of flexibility of policy, for example, three years time for seed release and register impedes the efficiency of supply sector instead using many location for test can minimize the time to a year
- Organizing market follows a very complicated and tedious process that took time and energy of farmers and staff, cooperative law is not flexible to take other forms of organization (groups).
- Absence of strong quarantine for imported and shopped crop varieties' seeds.
- Low attention with regard to seed biodiversity; particularly for those of our endemic/indigenous crop varieties

Constraints of users (farmers)

From FGD and user survey conducted, farmers pointed out the constraints they had. The identified constraints by demand sector are discussed below.

Among three crops selected for the study (coffee, haricot bean and maize), prioritization of crops in terms of the level of constraints faced by farmers towards each commodity during the process of input delivery was identified by respondents. According to the survey result, the rank given by the farmers i.e. maize 109(54.5%), coffee 30(15%) and haricot bean 19(9.5%) was first, second and third respectively. Therefore, maize found to be a crop that is highly constrained in input supply system (see Appendix table 2).

The constraints of farmers in agricultural input/ service delivery were identified during user survey. From the result obtained, exorbitant input price, mismatch in kind, inability to deliver timely, insufficient delivery, source from far distance, poor quality of inputs and less extension support were identified and ranked according to their importance. Table 6 illustrates respondents' perception in terms of frequencies, percentage and rank.

Table 6: Constraints of farmers in agricultural input/ service delivery (N=200)

S.No	Types of constraints	Frequency	%	Rank
1	Exorbitant input price	45	22.5	1
2	Mismatch in kind	29	14.5	2
3	Not timely	27	13.5	3
4	Insufficient delivery	23	11.5	4
5	Source from far distance	14	7	5
6	Poor quality	11	5.5	6
7	Less extension support	9	4.5	7
	No response	42	21	

Source: computed from own survey result, 2009.

From the result obtained, exorbitant input price was ranked as the first constraint of agricultural input demand by the farmers. The focus group discussion revealed that currently agricultural input price was escalated beyond the affordability of many farmers. The discussant mentioned that the price of fertilizer and seed increased by more than double fold comparing to past 2-3 years. This in return discouraged farmers to demand for production enhancing inputs.

The second constraint described by the sample respondents was mismatch with demand in terms of kind of inputs. During the focus group and key informants discussion, participants pointed out that there was difference between the demands in kind and inputs delivered in the study area. For example, improved maize variety like BH-540 has got high demand by the farmers for its high adaptability and yield potential. However, the delivered maize varieties were BH- 140 and BH-660, which were out of their demand.

The third constraint of farmers demand for agricultural input supply is timeliness of input delivery. As crop production is associated with planting time, inputs should be delivered ahead of time. According to focus group discussants, they suffered with problems regarding to the delay of inputs supply which in turn contributed pest attack and yield loss for lately planted crops.

The fourth constraint of input supply is insufficient delivery of inputs. The focus group discussion revealed that currently farmers suffered with shortage of agricultural inputs. According to discussants, the amount of input delivered is by far lesser than the required. The collected down payment from farmers for input purchase is returned back to farmers due to shortage of inputs. This, in response, seriously exposed farmers to purchase unknown source of inputs from local markets in the name of improved technologies but weak in their yield potential and quality.

The fifth constraint of input supply was source from far distance. As the survey result showed, there are no input stores at farmers' disposal. Therefore, farmers tend to move long distance (10-25kms) to bring agricultural inputs. This may discourage them to search for improved agricultural inputs. According to key informants and discussants, unavailability of inputs at their disposal forced them to remain on traditional practices.

Case study 2

Tilahun Gabisso is living in Manche PA of the study area. He is a farmer who engaged mainly on coffee, maize and haricot bean farming in conjunction with livestock rearing. He shared his experience in using agricultural inputs/services. He said, "I don't have serious problem in the process of coffee cultivation, because I can get coffee seedlings nearby from public nursery or private farmers' nursery. In addition to this, as I prepare organic coffee for the central market, I am using organic fertilizer such as compost for my coffee orchard. The only problem I had is fluctuation of market price and yield loss due to recurrent moisture shortage. A big problem I had is lack of services like credit, improved maize and haricot bean seed supply and commercial fertilizer provision. Let me share my experience in this regard," said Tilahun, "last year, I have been asked by DAs to pay down payment for the inputs I need with the hope to receive, and I paid 412 birr for maize seed and fertilizer. I assumed that they would provide me on time prior to planting time (mid-march). I waited, but I couldn't get and DAs have advised me to wait patiently. Even if I waited as per DAs' advice, the planting time is passed and finally theyreturned 412 birr to me. When I asked the reason, they said that the woreda has finished its quota. Mind you, this condition exposed me to two problems. First, I couldn't even plant the local one timely and second, due to late planting I couldn't get harvest from the seed and fertilizer that I bought from local market. This, in return, exposed my family for serious food shortage. Therefore, what I suggest is that, here we have service cooperative and let us strengthen together the organization to provide us input and credit, because many years ago we have a trend in paying our debts on the basis of delivering ripened coffee cherries to the cooperative".

4.2 Major factors that influence the smooth functioning of the system

Factors that influence the smooth functioning of the system is seen using questionnaire for input/service providers and focus group discussions and interview schedule for users. Therefore, in this section, findings are discussed from input/service providers and users point of view independently.

4.2.1 From Input/ service providers perspective

For the successful provision of agricultural inputs/services the input supply sector should work in harmony to satisfy the need of the clients. During the study, factors that influence the smooth functioning of the supply sector were identified by each partner involved in the system in terms of input supply and knowledge provision. From the result obtained, the sector is positively/negatively influenced by the following major factors:

Input suppliers

- Sufficient and irrigable seed farm (-)
- Skilled man power (+)
- Delay of temporary loan settlement by users (-)
- Policy, in creating conducive environment (+/-)
- Storage facilities at grass root level (-)
- Efficient marketing system (-)
- Timely demand claims from users (-)
- Demand for improved crop varieties (+)

Knowledge providers

- Organizational mandatory clarity (+/-)
- Clearly defined role and responsibilities of each partner (-)
- Availability of improved seeds in terms of their germination, viability and adaptability (+)
- Research centers cooperation and willingness to share resources including knowledge (+)
- Farmers willingness to take risks (+)

4.2.2 From farmers/users point of view

In this section, the result would be presented on the basis of methods used to collect data. In the first sub section, the result of FGD would be presented, and users' survey data results presented in the second sub section. To find out influential factors of the demand sector, focus group discussions were made in the selected four sample PAs. From FGDs conducted, prioritization of

influential factors is carried out by using pair wise ranking. Table-7 shows identified factors by the farmers in priority order.

Table 7: Influential factors of input demand- supply index from farmers perspectives

S.No	Influential factors	Scores				Sum of scores	Rank
		Shoye PA	Manche PA	Debub mesinkela PA	Danshe sire PA		
1	Credit	3	4	4	4	15	1
2	quantity	2	2	3	3	10	2
3	Price	1	3	3	2	9	3
4	Timeliness	1	1	4	1	7	4
5	Pest	0	0	2	0	2	5
6	Quality	0	0	1	0	1	6

Source: Own survey 2009

From the result obtained, lack of insufficient credit service, low quantity of input delivery, high cost of input price, timeliness, pest attack and quality are crucial factors that singled out by the farmers according to their priority order respectively. Based on FGD findings, some of the identified factors are discussed in this section.

Input credit

The most important roles that credit is expected to play in agriculture may include- facilitating adoption of improved agricultural technologies, transformation of traditional agricultural practices, mitigating adverse conditions (drought, crop failure, disease and price uncertainties), improving physical and human capital, increasing farm efficiency, increasing flexibility of farmers decisions, attaining economies of scale in production, consumption, smoothing, and so on (Edlengaw, 2006).

From the result obtained, insufficient credit service was the most serious problem remained unsolved in the study area. The probable reason for this is lack of commitment of facilitators at

woreda level. According to the Sidama Zone Agriculture and Rural Development Department (SZARDD), the agricultural credit system is of two types (extension package and household package) - for extension package especially for inorganic fertilizer (DAP and UREA), BoARD of the region is responsible to finish loan agreement with the branches of Commercial Bank of Ethiopia. Head of zonal and woreda administration, finance and economy branch offices and WARDO are also responsible to sign on the modalities and they have to confirm that their running cost budget accounted for collateral.

For house hold packages, Rural Finance Fund (RFF) is responsible to deliver loan to farmer cooperatives through their unions. In most cases improved seed would not be provided in credit basis, therefore farmers are forced to pay 100% of the price.

According to WARDO, fertilizer credit is given to the farmers with 25-50% down payment using quota system. During focus group discussion, farmers seriously underlined that the input credit for each PA distributed was very limited which does not exceed from few farmers. Therefore, the majority of the farmers remained without getting fertilizer credit. However, fertilizer suppliers confirmed that there is no input shortage in their stock rather the problem emerged due to lack of using allocated loan fully by the woreda. From the survey result, the reason why they underuse yearly allocated loan for fertilizer is due to collateral in the loan agreement. Inability for timely settlement of the debt causes the transfer of the woreda running cost budget to commercial bank accounts. Therefore, to minimize the risk what they did is limiting the amount of loan to manageable size for recollection of the remaining debt.

Lack of input credit is not associated only with access and utilization it also associated with debt settlement. If a given PA did not settle previously utilized debt, it will not get input credit for coming crop seasons. This, in return, disfavored the majority of the farmers by exposing to three main problems;

- farmers who settled their debt timely could not get input credits due to farmers who did not settle their debts in a given period of time.
- farmers would be exposed to serious food shortage due to low productivity.

- consequently most farmers are migrating to nearby towns and PAs to be hired as daily laborer to search alternative sources of income.

On the other hand, inputs delivered to the farmers are not in sufficient quantity, not timely and are costly. This also exposed farmers to four main problems;

- inability to deliver inputs as per farmers demand (in type and quantity) made farmers unable to increase their productivity per unit area by influencing on the growth of the total production in the woreda.

- even inputs which delivered in small quantity, does not reach at farmers' disposal timely. This has caused for low productivity due to incidence of crop pests and shortage of moisture due to late planting.

- the cost of inputs is increasing from time to time by causing smallholder farmers out of the game. This resulted the majority of poor farmers not to adopt production enhancing inputs and consequently the overall productivity of the woreda would be affected to meet the proposed goal.

- Insufficient delivery of inputs may force farmers to search alternative market source (local market) where the quality of inputs is in question. As it was clearly observed, the quality of seeds and fertilizer sold from local market was very poor for productivity and increasing soil fertility respectively.

The current seed and fertilizer supply channel in the woreda would take the following forms:

Fertilizer

Federations ⟶ Cooperative Unions ⟶ Primary cooperatives ⟶ Farmers
(WARDO)

Seed

Seed suppliers ⟶ WARDO ⟶ Farmers
↑
Zonal ARDD plays facilitation role

Case study 3

Workenesh Toramo is a woman farmer living in the study area, Danshesire PA. She is working as a leader of women's credit and saving group. She shared us her experience in agricultural inputs/service provision in her PA. She said, "due to lack of access of women farmers to agricultural inputs, credits and extension service, we did not get chance to benefit from services to improve our livelihood status, rather we are searching for food aids. Though the PA has potential for crop production (maize and haricot bean), credit and input provision is very poor. Hence, most farmers are forced to continue with traditional practices resulting in low yield and income". As she added, "due to shortage of income I could not afford to give enough food for my children who attend school in Yirgalem town (capital of the woreda). As our soil is very poor in nutrient content, planting food crops without commercial fertilizer is unthinkable. Though starting from last year, we have started to be organized in credit and saving groups to save 2 birr on monthly basis, still we are in short of the above mentioned services. Therefore, attention has to given by responsible bodies to women farmers to make us more productive and self sustained".

4.2.3 Descriptions of personal, socio-economic, situational, and organizational and institutional characteristics of sample respondents

In this section, descriptions of personal, socio-economic, situational, and organizational and institutional characteristics are presented and discussed in detail. These are the hypothesized variables that might influence the dependent variable, input demand-supply index.

4.2.3.1. Descriptions of personal characteristics of the sample respondents

Personal Characteristics include the variables related to personal characteristics such as age and level of education. The distribution of sample respondents based on their personal characteristics is presented in Table 8.

Table 8: Distribution of sample respondents based on their personal characteristics (N=200)

Variables	Attributes	Frequency	Per cent
Age of respondent	15-29 (younger)	26	13
	30-49(middle)	139	69.5
	50- 65 (older)	28	14
	>65 (oldest)	7	3.5
	Total	200	100
Education level	Illiterate	30	15
	Can read and write	43	21.5
	Primary school	92	46
	Secondary school	35	17.5
	Total	200	100

Source: computed from own survey data, 2009.

Age of the respondents

Age of farmers was one of the demographic characteristics hypothesized to influence agricultural inputs demand negatively; towards this end data on the age of farmers with respect to input demand-supply index seems important.

The age of farmers who participated in the study ranged from 20 to 110. Farmers aged 30-49 were the majority (69.5%) followed by age group 50-65(14%), 15-29(13%) and age group >65(3.5%).

Level of education

Education is one of the important variables, which increases farmer's ability to use production enhancing agricultural inputs. Low level of education and high illiteracy rate is typical in developing countries like Ethiopia. In fact, education level of farmers is assumed to increase the

ability to use improved agricultural inputs in a better way. Therefore, in this study, education level is a variable helping to demand production enhancing inputs by the respondents.

As indicated in Table 7, 15% of the sample respondents were illiterates, 21.5% were able to read and write, 46% had elementary school education, and 17.5% had attended secondary school education. From the data presented, number of educated farmers (> 63%) is by far greater than that of illiterates (21.5%).

4.2.3.2. Descriptions of socio-economic characteristics of the sample respondents

Socio-economic factors relate to the purchasing power of farmers to agricultural inputs, which is determined by various social and economic variables such as size of land holding, annual income, family labor and input price. The findings are presented in Table 9.

Table 9 : Distribution of sample respondents based on their socio-economic characteristics (N=200)

Variables	Attributes	Frequency	Per cent
Land holding	0.125-0.5	85	42.5
	0.51-1	93	46.5
	1.01-2.5	22	11
	Total	200	100
Annual income	500-1500	33	16.5
	1501-2500	41	20.5
	2501-4000	57	28.5
	4001-5500	38	19
	5501-7000	18	9
	7001—8500	5	2.5
	8501-10000	3	1.5
	>10000	5	2.5
	Total	200	100
Family labor	0.5-3.9	160	80
	4-6	38	19
	6.1-9	2	1
	Total	200	100
Input price	Yes	1	0.5
	No	199	99.5
	Total	200	100

Source: computed from own survey data, 2009

Size of land holding

Land is a primary source of livelihood for all rural households. It was assumed that larger the farm size, higher is the possibility to use a combination of improved agricultural inputs. In the study area, the size of the land owned differed from household to household.

Of the total 200 respondents, 85 (42.5%) own between 0-0.5 hectare, 93 (46.5%) own between 0.51-1 hectare, while only 11 (1.3%) own 1.01-1.5 hectares of land. Average land holding of total respondents was about 0.723 hectare with maximum and minimum of 2.50 and 0.125 hectares respectively.

Annual income of the respondents

Total annual cash income is an important variable explaining the characteristics of households, in that those who have earning relatively high income could probably increase the purchasing power of agricultural inputs and this in return would expose them to demand inputs. Results of different empirical studies show the effect of annual income on house holds' decision in using and adopt improved agricultural technologies. For example Kidane(2001) , Dejene et al., (2001) and Getahun (2004) reported positive influence of households' farm income on adoption of improved agricultural inputs. As indicated in Table 9, the minimum and maximum annual income was Birr 500 and Birr 25000 respectively.

Family labor

Higher number of family active labor force leads to decisions to take risk for participation in technology packages. Therefore, family labor force contributes to the variation in agricultural input demand. In this study, family labor force was assumed to have positive relation with the dependent variable. Similarly the result of the study conducted by Bezabih (2000) on the role of new varieties and chemical fertilizer revealed that the rate of adoption of chemical fertilizer is positively influenced by the number of man equivalent.

Family labor force in the study area ranges from one person to nine persons with an average of 2.82 adult equivalents per household. The respondents were placed under three family labor force categories. Based on this, 80%, 19% and 1% had in the range of (0.5 – 3.9, 4 – 6 and 6.1-9) adult equivalents respectively.

Input price

The price of inputs may be seen in terms of affordability by small scale farmers. Affordable prices of inputs may enhance farmers' interest to purchase inputs from the distribution centers,

whereas exorbitant input price lead poor farmers to not demand improved agricultural inputs. Therefore, the variable is expected to have negative effect on the demand of agricultural inputs. From the data, almost all 199(99.5%) of the respondent noted that the price of input is not affordable. From the result of qualitative analysis, though the price is unaffordable, farmers were subjected to use below recommended rate and partly use of package inputs due to lack of alternative input sources (see Appendix table 5). The variable was not computed for statistical analysis due to relatively very low variability among respondents.

4.2.3.3 Descriptions of situational characteristics of the sample respondents

Situational characteristics include the variables that might influence farmers demand for improved agricultural inputs such as type of road used, access to market and distance from nearest input market. The findings are presented in Table 10.

Table 10: Distribution of sample respondents based on their situational characteristics (N=200)

Variables	Attributes	Frequency	Per cent
Type of road used	No access	24	12
	Winter season	35	17.5
	All weathered	141	70.5
	Total	200	100
Access to market	Yes	73	36.5
	No	123	63.5
	Total	200	100
Distance from nearest input market	.3-5	13	6.5
	6-10	52	26
	>10	135	67.5
	Total	200	100

Source: computed from own survey data 2009

Type of the road

Type of the road may have an influence on input demand- supply index. All weathered roads would fever the inlet/outlet of farm inputs and produce at/from farmers' disposal. From the data obtained, 24(12%), 35(17.5%) and 141(70.5%) of the respondents have no access, winter season road and all weathered road respectively. According to respondent farmers, even if they have roads meant for transportation, due to lack of allocation of transport vehicles by responsible bodies still the problem remain unsolved.

Access to market

Access to input /output marketing may have positive association with farmers' demand for agricultural inputs and to sell their produce with reasonable price. From the data obtained, 73 (36%) of the respondents have no access to market and 127 (63%) have access to market.

Distance from nearest input market

The availability of inputs on nearby markets would have positive influence for farmers to demand inputs. Whereas for farmers who located far from input markets may have relatively negative influence to demand agricultural inputs. From the finding, farmers who live in different range of distance (0.3-5, 6-10 and >10) are 13(6.5%), 52(26%) and 135(67.5%) respectively from nearest input market. Though for the purpose of the survey, 2 PAs are selected from nearby PAs and 2 are from far, their settlement within the PA varies even in the nearby PAs from the center.

4.2.3.4 Distribution of sample respondents based on organizational and institutional factors

Organizational and institutional factors include the variables that might influence farmers demand for improved agricultural inputs such as access to credit institutions, storage facilities, existence of service cooperatives and extension service. The finding is presented in Table 11.

Table 11: Distribution of sample respondents based on their organizational and institutional factors (N=200)

Variables	Attributes	Frequency	Per cent
Access to credit	Yes	117	58.5
	No	83	41.5
	Total	200	100
Storage facility	Yes	0	-
	No	200	100
	Total	200	100
Extension contact	0	22	11
	Rarely	39	19.5
	Once in a month	33	16.5
	Once in 3 weeks	41	20.5
	Once in 2 weeks	40	20
	Once in a week	25	12.5
	Total	200	20

Source: computed from own survey data 2009

Access to credit

Access to credit can address the financial constraints of farmers. The finding shows that, 58.5% of the respondents had no access to credit institutions, whereas, 41.5% had access to and utilization of credit from institutions. Among those who have access to credit institutions, only 21.5% of them have got credit in 2008 production year in the study area. The constraints for access to credit in the study area might be lack of efficient credit system at farmers' disposal.

Storage facility

Existence of storage facilities at farmers' disposal would have an advantage for input suppliers to damp and timely deliver agricultural inputs. As a matter of chance no warehouses were seen that meant for input storage in the study area. From the data collected, the response of all respondents was the same (200%) and showing the absence of storages. This entails farmers are subjected to high transport cost and lack of timely delivery of inputs. Therefore, this variable could not show

variation among respondents in relation to their input demand, and not included in statistical analysis.

Extension contact

Farmers' proximity to agricultural extension services would have positive influence on demand for agricultural inputs due to increased adoption rate of farmers on improved agricultural inputs. The variable is computed in terms of farmers' proximity/contact with DAs. From the survey, 178 (89%) of the respondents have contact with DAs at different level of frequency (rarely 39, once in a month 33, once in three weeks 41, once in two weeks 40 and once in a week 25) and the rest 22(11%) had no contact.

4.2.4 Relationship between dependent and independent variables

This section covers the findings on relationship between input demand-supply index (dependent variable) and independent variables (personal factors, socio-economic factors, situational factors, and institutional and organizational factors) through, Pearson correlation analysis for continuous variables, Chi-square test and Cramer's V for discrete/categorical variables and Spearman's rho Non Parametric Correlation analysis for dummy variables.

Table 12: Relationship between dependent and discrete/ categorical independent variables

Discrete /categorical independent variables	Input demand supply index			
	X^2	df	p	Cramer's V
Education level	124.730	3	.661	.456
Type of road used	137.427***	2	.001	.586
Extension contact	240.224*	5	.068	.542

*** , * Significant at 0.01 and 0.1 level

The output of chi-square test in Table 12 is generally revealed that, among the three discrete/categorical independent variables, type of road used and extension contact show positive and significant association with the dependent variable at 1%and 10% level of significance respectively.

Table 13: Relationship between dependent and continuous independent variables

Continuous independent variables	Pearson correlation analysis	
	r	p
Age of the respondent	-.073	.303
Active labor force of the family	.081	.251
Total farm land owned	.048	.501
Annual income of the family	.053	.638
Distance from the nearest input market	.206**	.013

** Significant at 0.05 level (2- tailed)

The output of Pearson correlation analysis in Table 13 indicates that, out of five continuous independent variables, distance from the nearest input market is positively and significantly associated with the dependent variable at 5% level of significance. The probable reason for positive significance of distance from the nearest input market is majority of respondents are located in distant villages even within the nearby PAs (see Table 10).

Table 14 : Relationship between dependent and dummy independent variables

Dummy independent variables	Spearman's rho correlation analysis	
	r	p
Access to credit	.187**	.008
Access to market	.096	.177

** Significant at 0.01 level (2-tailed)

The output of Spearman's rho correlation analysis in Table 14 indicates that, out of two dummy independent variables, access to credit is positively and significantly associated with the dependent variable at 1% level of significance.

4.2.5 Multiple Linear Regression Analysis

In the preceding parts of this thesis the descriptive analysis and bivariate analysis of important independent variables, which are expected to have influence on input demand- supply were presented. In this section, the selected independent variables were put to Multiple Linear Regression (MLR) model to identify the factors influencing agricultural input demand-supply

index of farmers. A MLR model was fitted to estimate the influence of the hypothesized independent variables.

Prior to the estimation of the model parameters, it is crucial to look into the problem of multicollinearity or association among the potential candidate variables. To this end, the variance inflation factor (VIF) was used to test the degree of multicollinearity among the continuous variables and contingency coefficient test for categorical/dummy variables.

The value of VIF for continuous variables was found to be less than 10 (see appendix table 8). To avoid serious problem of multicollinearity, it is quite essential to omit the variables with VIF value greater than or equal to 10 from the MLR analysis. As a result all 5 continuous independent variables were retained and entered into MLR analysis. For categorical/dummy variables contingency coefficient test was worked out to test the existence of multicollinearity effect. As a result the values of contingency coefficients were less than 0.75 and no serious multicollinearity problem was occurred among the independent variables (see appendix table 12).

The variable input demand-supply index was used as a continuous dependent variable. Eventually, a set of five (5) continuous independent variables, three (3) discrete/categorical and two (2) dummy variables were included in the model and used in the MLR analysis (see appendix table 13).

These variables are selected on the basis of theoretical explanations and the result of various empirical studies. To determine the best subset of independent variables that are good predictors of the dependent variable, the MLR were estimated using SPSS 12 version. In this method all the above mentioned variables were entered in a single step.

Table 15 : Coefficients of regression function

Variables	Coefficients			
	β	Std.Error	t	Sig.
Constant	.821	.155	5.290	.000
AGE	- .004*	.002	-1.786	.076
ACLF	.036*	.021	1.726	.086
TYPRD	-.110***	.037	-2.942	.004
ACTMKT	.034*	.018	1.698	.085
EXTCON	.028**	.014	1.982	.049

***' **, * Significant at 0.01, 0.05 and 0.1 level

Table 17 shows that, out of 10explanatory variables considered in the model, only five variables were found to be significantly influencing on input demand-supply index at 0.01, 0.05 and 0.1 levels of significance. These variables include age of the HH, active labor force of the family, type of road used, access to market and frequency of contact with DAs. 5 of the 10 explanatory variables (see Appendix table 13) were found to have no significant influence on input demand-supply index in the study area. The variables derived as output of the model, are described below.

Age of the household (AGE): from the result obtained, as number of HH head age increases by a unit, input demand-supply index of the HH would decrease by .004 unit. This entails when the age of the HH increases the probability of taking risk to use improved agricultural inputs would decrease. This result concurs with the findings of Mahdi (2005).

Active labor force of the family (ACLFOF): The result showed that as number of active labor force of the family increases by 1 unit, input demand-supply index of the family would be increase by .036 units. This implies when the number of active labor force of the family increases taking the risk of using production enhancing inputs would increase. This result coincides with the findings of Abadi and Pannel (1999) and Bezabih (2000).

Type of road used: the analysis revealed that having road which is inconvenient to transport inputs would deceases the input demand supply index by .110 units. This intailes the type of road is negatively influence the dependent variable and hence, having difficulties in transporting agricultural inputs would decrease the probability of purchasing production enhancing inputs. The result concurs with the findings of Tesfaye and Shiferaw (2001).

Access to market (CACTMKT): as we can see from the analysis that having access to market would increase input demand-supply index of the farmer by .034 units. This implies farmers who have access to market regardless of input/output marketing, would have the probabilty of demanding production enhancing inputs as compared to farmers who do not have market access.

Extension contact (EXTCON): It was hypothesized that this variable has positive influence on the dependent variable. From the result obtained as frequency of contact with development agent increases by a unit, input demand-supply index of the farmer would be increase by 0.028 units. This implies when farmers have regular contact with extension agent, probability of using production enhancing inputs would increase through increased awareness from the extension organization. This result will coincide with Kidane (2001) and Techane (2002) who have reported significant and positive relationship of extension contact and use of agricultural technologies.

4.3 Policy and Institutional Environment for Agricultural Input Demand-Supply System

In analyzing the existing input demand-supply system of the country in general and the study area in particular, policy and institutional environment for channeling the services is crucial. According to Hagmann *et al*. (2002) as cited by Anteneh (2007), service delivery framework this level is called 'Supporting the Response'. At this level, analysis on the policies and legislation for the institutional arrangements of service provision, monitoring and evaluation and quality assurance of the service for regulating service provision modes and arrangements was undertaken. The analysis was made based on narrative analysis of government policy and strategy documents. It was backed up from public sector input suppliers, MoARD offices existing at different levels and past studies conducted by some scholars.

4.3.1 Institutional arrangements

There exists a multiple actors in the service delivery and regulatory institutions in the public, private, farmer based organization, civil society and NGOs with verified responsibility and yet complimentary. Currently, the agricultural marketing and input sector in the MOARD with its decentralized structure has developed implementation strategy to coordinate and support in capacity building for the production, supply, distribution and marketing of agricultural inputs system in the country (MoARD, 2005).

However, the public system is not functioning in an efficient or coordinated manner for the financing and delivering inputs/services there by support responsive input/service delivery system due to poor institutional linkage between different public organizations at different levels, and between public organizations and other players in the system (i.e. private, cooperative unions, NGOs and civil society organizations). These weak linkages are exacerbated by the public sector's persistent emphasis on yields and technologies rather than more comprehensive focus on improving the service delivery (Spielman *et al*.2006).

With regard to financing and delivery of the research system, agricultural research is also the services that demonstrate existence of multiple actors in the financing and provision of the research services especially for maize and participatory research in the country. The limited research under taken by the private sector like Synegnta and pioneer hybrid in maize research can be referred.

4.3.2 Seed systems and policy

From an economic point of view, determining the appropriate role of the state and the private sector in the market for seed is a complex issue. Seed systems are, by their nature, subject to a variety of unique market and institutional constraints (Tripp and Louwaars, 1997, Gisselquist and Van Der Meer, 2001). First, problematic property rights questions arise from fact that improved seeds can, in many cases, be reproduced by the farmer, thus reducing the ability of breeders to appreciate the gains from their innovative activities and investments. Second, information asymmetries result from the inability of farmers to make *ex ante* assessments of seed quality,

since the seller retains such knowledge in the absence of certain types of regulation. Third, coordination problems result from difficulties in monitoring and enforcing contracts for seed use. Finally, inelastic supply responses result from the inability of breeders to respond effectively to the changes in seed demand that result from expectations of market prices, household incomes, rainfall, and other determinants of farmers' planting decisions. Nonetheless, over time, many of these failures can be resolved through enactment of plant variety rights and truth in labeling laws, eventually allowing developed seed systems to be largely driven by the private sector.

Until 1992, there was no coherent national policy for the development of seed industry. In 1993, a national seed industry policy and strategy was formulated to guide seed sector development. The National Seed Industry Council (NSIC) was established under Proclamation No 56/1993 and become responsible for advising the Government on policy and regulatory issues that would help improve and build a sustainable national seed supply system. Proclamation No122/98 amended the members of the Council (Getnet *et al*., 2001). The main objectives of national seed industry policy are to:

- Streamline evaluation, release, registration and maintenance of varieties developed by national programs.
- Develop an effective seed production and supply system through participation of public and private sectors.
- Encourage the participation of farmers in germplasm conservation and seed production.
- Create functional and efficient institutional linkages among seed industry participants.
- Regulate seed quality, seed import export trade, quarantine and other seed related issues.

In the national seed industry policy, emphasis have been given to agricultural research institutions, the Ethiopian Seed Enterprise (ESE), state farms, private farms and farmers as major producers and suppliers of seed. The private sector is expected to play an important role in seed sector development.

A Ministerial Regulation No. 16/1997 which was enacted to cover registration of varieties, seed producers, processors, distributors, quality control, seed trade (import-export), etc. has been

replaced by Seed Proclamation No. 206/2000. The latest Proclamation is more comprehensive and creates stronger legal framework for the protection and control of the interests of all players in the seed industry. Moreover, field and seed standards prepared for 74 crops are officially issued for implementation.

Shortcomings in seed quality and timeliness of delivery have been an issue in Ethiopia for several reasons. First, the ESE supplies seed with only a limited number of traits capable of addressing the many biotic and abiotic stresses found across these farming systems and agro ecologies. Second, concerns have been raised regarding the quality of seed provided by the ESE. Poor cleaning, broken seeds, low germination rates, and the presence of mixed seeds has been commonly reported in ESE supplied seed (DSA 2006). Third, the official process of procuring, stocking, and distributing seed often fails to meet the time-sensitive needs of farmers. Numerous surveys have found that seed procurement and distribution through official channels is often not conducted in a timely or coordinated manner. Seed is either distributed after the optimal planting time, or the varieties distributed are not appropriate to changes in farmers' expectations of weather (e.g. Sahlu and Kahsay 2002; DSA 2006; EEA/EEPRI 2006).

As it was discussed in literature review part, timely delivery of agricultural inputs with sufficient quantity as per the demand of users would enhance the consistent use of agricultural technologies to boost productivity of individual farmers in particular and the farming community in general. From the discussion with WARDO and key informants, improved maize seed delivered to the woreda was not timely and not according to the demand. Moreover, according to SZARDD, the quality of BH-660 (maize variety) seeds delivered this year (2009) by private investors and Hawassa state farm found to be worse (full of broken, shriveled and poor in germination). Though seed policy and legislations are issued regarding quality, due to weak controlling system and inability to implement rules and regulations the demand sector faces this problem repeatedly.

Variety Release and Registration

Agricultural research in Ethiopia has a relatively long history and is carried out by a number of institutions. In the past EARO has a national mandate to conduct and coordinate research, but institutions of higher education (universities and colleges) are also engaged in agricultural research. Moreover, specialized units in the MoARD and other public sector organizations conduct adaptive and applied research for their own needs (Getnet et al. 2001).

Agricultural research has been reorganized recently as part of the Government effort to promote the agricultural sector of the economy. From 1998, the former Ethiopian Agricultural Research Organization (EARO) and the now Ethiopian Institute of Agricultural Research (EIAR) became operational and a focal point for implementing national agricultural research in Ethiopia. Some main agricultural research centers have been transferred to the Regional States and are accountable administratively to Regional Agricultural Bureaus but technically to EARO. EARO has 14 main research centers and 29 sub-centers located in various agro ecological zones of the country. The organization has a strong collaborative research with international agricultural research centers such as CIAT, CIMMYT, ICARDA, ICRISAT and IITA (Ibid).

Ethiopia is the primary center and diversity of most important agricultural crops. The country is endowed with rich genetic resources. The Institute of Biodiversity Conservation and Research (IBCR) was established in 1975. IBCR is responsible for collection, conservation, characterization and utilization of Ethiopia's germplasm. It is a major source for germplasm for crop breeding for NARS in the country (Ibid).

The variety release and registration system has evolved over a number of years. Since 1984 variety release and registration has become the responsibility of the NVRC. The Committee is composed of breeders (4), agronomists (1), crop protection specialists (2), research/extension (1) and socio-economists (1) representing different research institution and user organizations. The membership includes the EARO, Institute of Biodiversity Conservation and Research (IBCR), Awassa College of Agriculture, NSIA, Coffee and Tea Development Authority (CTDA), and the Ministry of Agriculture (MoA). The NVRC proposed a reform of its current structure and functions and elaborated procedures for variety release and registration of horticulture, fruit and

tree crops. The Seed Quality Control and Certification Department of NSIA serves as the secretariat of NVRC. Varieties are in extensive trials before they are proposed for release at regional or national level. Breeders carry out a minimum of two to three years national or regional trials (NYTs) in at least three to five locations or different agro-ecological zones before submitting an application to NVRC. The variety should be tested for yield, tolerance to pests and other important agronomic characters compared with standard varieties or local check. Superiority in yield, grain quality and acceptable level of distinctness, uniformity and stability are required to grant a release (Ibid).

According to the key informants of improved maize variety suppliers, the time given for variety release has to shorten and improved through increasing number of locations in different agro ecological zones to test for various characters. This in return would have advantage for both sectors to update the existing varieties and deliver high yield potential varieties within a short period of time as to satisfy the current high demand for improved maize technologies and increase production and productivity of farming community to ensure food self sufficiency.

4.3.3 Fertilizer and credit policy

Unlike seed, fertilizer is a private good that should be well suited to private market development in Ethiopia. However, a number of features of fertilizer have complicated market development in the early stages of adoption. On the demand side, fertilizer is a highly specialized input, the efficient use of which generally requires complementary inputs (e.g. improved varieties), as well as higher levels of management. Most final consumers of fertilizer—smallholders—are widely dispersed geographically, and most of them are poor, so creating a market can be costly. Furthermore, in rainfed areas, fertilizer consumption is highly seasonal (a 2-3 month market window), and year-to-year fluctuations in rainfall patterns contribute to high inter-year variability in demand for fertilizer, with corresponding risks of high carryover stocks from year to year. On the supply side, fertilizer is a bulky input, with relatively low value to volume. This means that transportation costs can make up a large share of final selling prices, even despite considerable economies of size in international procurement and shipping. In countries that import fertilizer (such as Ethiopia), the supply chain from fertilizer production to the final user, the farmer, is long in terms of both distance and time, often requiring over six

months from initial orders to final purchase. Hence, liquidity along the supply chain is often a constraint. Due to these constraints on both demand and supply, public interventions in fertilizer markets are common in the early stage of market development (Getnet *et al*, 2001).

However, since 1999 the private sector that had initially responded to the reforms has largely exited the fertilizer market. In the case of imports, the share of private firms operating in the market went from 33 percent in 1995 to zero in 1999. Since then, the AISE has taken the majority share, followed by "private" companies closely affiliated with or owned by the governing party and, more recently, cooperative unions. In 2004/05, the share of party affiliated companies declined, and cooperative unions entered the import market with considerable technical assistance from the Ministry of Agriculture. The market share trends are similar in the case of wholesalers. While AISE had a market share of less than 50 percent during the mid- and late 1990s, it had regained the majority share by 2001, when private sector wholesalers, except for the party-affiliated companies, had disappeared from the scene. The decline of the private sector in the retail market was more dramatic. While private sector retailers held a majority share of the market in the early 1990s, the public sector and cooperatives have become almost the sole distributors of fertilizer since early 2000 (DSA 2006). As of 2004, the public sector accounted for over 70 percent of distribution, with private dealers accounting for only 7 percent of sales nationwide (EEA/EEPRI 2006). The public sector supply channels have also changed; whereas extension agents initially managed distribution, the responsibility was shifted to local input supply offices in more recent years.

Difficulties are also evident in the estimation of demand and distribution of fertilizer. Estimates of demand are compiled through official channels and aggregated to the national level as in the case of seed. Importers respond to official demand estimates and organize distribution through the regional bureau of agriculture or cooperatives, depending on the region (DSA, 2006).

The current government policy is to target at least 80 percent of fertilizer sales through cooperatives, which are eventually intended to replace the public sector involvement in retail distribution of fertilizers. This process, as with the importation process, tends to favor those

firms or organizations with access to capital markets and experience in navigating the regulatory and administrative systems at both the federal and regional levels.

To ensure the uptake of the seed-fertilizer technological packages, regional governments in Ethiopia initiated a 100 percent credit guarantee scheme beginning in 1994. Under this system, about 90 percent of fertilizer is delivered on credit at below-market interest rates as part of packages (incorporated with extension programs), displacing what had previously been retail sales from the private sector (including a substantial share on cash basis). In order to finance the seed-fertilizer technology packages, credit is extended to farmers by the Commercial Bank of Ethiopia (a state-owned bank), through cooperatives, local government offices, and more recently, microfinance institutions (MFIs) and one cooperative bank. Since 1994, the number of active cooperatives, cooperative unions and MFIs has expanded. These organizations have gradually assumed part of the guaranteed credit program, which had reached some four million farmers with guaranteed credit of nearly $70 million in recent years.

Credit recovery, using extension agents and a degree of coercion by local administrative officials, was generally successful until the collapse of maize prices in 2001 and the subsequent drought. In Oromiya, for example, recoveries had averaged above 80 percent up to 2001, but this figure dropped to 60 percent in 2002, forcing major rescheduling of loans. As a result of the credit guarantee, the total amount of the defaults is now deducted from the Federal government block grants to each of the regions (Ibid).

Moreover, the regional government of SNNPR currently put credit norms in the basis of production seasons i.e. for *belg*, 75% of inputs would be delivered in cash and only 25% was meant for credit with 25% and 50% down payment and for that of *meher,* input credit is delivered with ranging from 25% - 50% down payment for inorganic fertilizer. No credit is provided for improved seeds.

According to WARDO seed- fertilizer channel is complex and bureaucratic due to inefficient facilitation by concerned partners. The credit system is also taking many steps to reach at

farmers' disposal. Moreover, credit modalities (norms) are disfavor of small scale poor farmers due to absence of money at times of down payment collection.

The current fertilizer supplier in the project area (Sidama Elto Crop Cooperatives Union) is not efficient due to weak organizational and institutional arrangements. Similarly, fertilizer credit provided by commercial bank of Ethiopia (CBE) is also full of obstructions like untimely release due to prolonged loan agreement process and inefficient uptake of credits by users due to link between government offices running cost budget and collateral. This, in turn, affected the commitment of grass root level policy implementers to help resource poor farmers through channeling efficient credit systems in a wider scope.

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The study area Dale woreda is one of the potential for coffee producing woredas in the region having two farming systems viz. coffee-livestock and haricot bean-livestock. To determine the input demand-supply index of the respondents, input required and obtained last year in relation to coffee, haricot bean and maize crops are taken into considerations.

The study was conducted in order to analyze the input demand- supply system of the area. It also tried to investigate, the status of linkage and knowledge flow among actors involved in the system, influential factors for the smooth functioning of the system and the enabling policy environment toward the system. To see the status of linkage and knowledge flow among partners, linkage matrix and knowledge network analysis of RAAKS tools were used. For identifying the influential factors both qualitative and quantitative method of data collection were used i.e. for input suppliers, qualitative analysis was used through questionnaires distributed, and for demand sector (farmers) FGD and interview schedule were conducted to collect data and analyzed using descriptive statistics and multiple linear regression from econometrics model. As to the enabling policy environment, Government policy content analysis on seed and fertilizer policy was made using different documents of policy and regulations of the country versus implementations.

According to the result of the study, linkage between farmers and relevant actors was found to be relatively weak, and whereas linkage among actors like WARDO, SZARDD, HARC,AWRC and IPMS found to be relatively strong. As far as knowledge/information flow from relevant actors to farmers is concerned, it was also found to be ‘sometimes’ and ‘rarely’. But information/knowledge flow between WARDO and relevant actors seemed to be somewhat frequent.

As to influential factors for the smooth functioning of the system, from input/service providers side; organizational mandatory clarity, sufficient and irrigable seed farm, skilled man power, setback of temporary loan settlement by users, policy environment, storage facilities at grass root

level, efficient marketing system, timely demand claims from users, clearly defined role and responsibilities of each partner, availability of improved seeds in terms of their germination, viability and adaptability, research centers cooperation and willingness to share resources including knowledge, farmers willingness to take risks and demand for improved crop varieties were some of mentioned factors that influence the system positively and/or negatively.

Moreover, from users' survey, the results of econometric model indicated the relative influence of different explanatory variables on the response variable. A total of ten (10) explanatory variables were included into the model, of which five (5) of them had shown significant influence on the dependent variable (input demand-supply index). Number of active labor force of the family, access to market and extension contact found to have positive and significant influence on input demand-supply index; and contrary to this, age of the household head and type of road used were shown negative and significant relationship with the dependent variable.

Regarding to the enabling policy environment, rules and regulations to implement policies and strategies found to be mainly constrained with lack of flexibility and commitment. Though the policy invited actors to involve in the system, especially in seed industry and fertilizer markets, due to lack of efficient management system and facilitation role by the bureaucracy, it is found to be not as expected. Accordingly, issues like durations for seed release and registration, cooperative law, quarantine measures for imported/shopped seeds and attention to seed bio-diversity (endemic/indigenous crop varieties) were some points raised from supply sector and pricing, quantity and credit system were some of issues raised from users to be revisited in the policy to strengthen the system and hence to create efficient and effective input/service delivery to farmers as to increase production and productivity of the study area in particular and the nation at large.

5.2 Conclusion and Recommendations

To bring sustainable agricultural development and ensure food self sufficiency of the nation, actors involved in the sector should act synergistically. Services like extension, input supply, credit provision, research and development were amongst all delivered in the project area for the realization of bringing about change at the peasant sector.

Agricultural inputs like seed, fertilizer, pesticides, improved farm tools, etc supply in line with efficient extension service would lead to ensure enhanced production and productivity. However, the supply of these production enhancing inputs/services were constrained with various factors. These factors together with several personal, situational, socioeconomic, and institutional and organizational factors greatly affected the input demand supply index of the sector in the area under study. Based on the research findings of this study, the following points are recommended to improve the input demand supply system of the study area.

For the strength of the system, the existence of strong linkage among actors within the system has a vital importance in a way that to transfer knowledge and provision of agricultural inputs/services in efficient and effective manner. Therefore, creating strong relationship among relevant actors through platforms, workshops and symposia has to consider with the aim of bringing strong partnership to reverse the existing livelihood status of the peasant sector.

Inaccessibility of credit is found to be serious problem to increase farmers' productivity in the sector. This, in response, disfavored the majority of small scale farmers in lowering their livelihood status and resulting for food shortage. Therefore, by improving the efficiency of credit system, timely and sufficient amount of delivering credit to farmers who engaged on crop production has to be considered as a central and core component of any development intervention in the sector. In line with this, due attention has to given to women farmers group to empower them and participate in productive activities through delivering agricultural input credits as to minimize vulnerability and improve their livelihood status.

Provision of inputs timely and according as to the demand of beneficiaries is crucial to boost up production and productivity of smallholder farmers. Accordingly organizing farmers groups

through primary cooperatives has significant importance to deliver inputs via cooperatives at the beneficiary disposal. Therefore, attention has to given for the strengthening of farmers organizations to involve in input distribution and credit provision for farmers and enhance bargaining power in competitive markets with support of GOs and NGOs involved in the sector.

To resolve problems related to the use of production enhancing inputs by farmers, establishing efficient extension service in the study area is mandatory. In this regard, the extension organization should work in harmony with research centers and NGOs in updating knowledge to be transferred to farmers' research extension groups (FREG) supported with relevant extension methods and approaches. Likewise, the extension service should give attention in accessing information/knowledge to women farmers through including women groups in its program as to participate in income generating activities and for accumulation of capital at household level. Moreover, attention has to be given by local administration to rural development and agricultural extension activities in facilitating infrastructures related to road and transportations for market in/outlets to change the life of resource poor farmers in particular and the rural society at large.

With regard to the enabling policy environment, flexibility of laws and changing paper to action is very important for the smooth functioning of the system. Flexible laws that could accommodate and recognize other informal types of organization like 'groups' may enhance the supply of inputs/services by service providers as to assist according to farmers need and willingness to involve in interventions to be conducted. Therefore, to fill the gap, polices related to farmers organization (groups), channeling efficient and effective credit service, time given for release and registration of new seed varieties, appropriate quarantine services to shopped and imported crop varieties, attention to seed biodiversity particularly those of our endemic/indigenous crop varieties, expansion of public and private seed multiplication farms supported with irrigation facilities and promotion of farmers to farmers seed multiplication and exchange has to be given due emphasis to reverse the impediments encountered due to inflexibility and inability to put in action of intended policies for the sector.

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7. APPENDICES

Appendix 1 Users survey interview schedule

General Instructions to Enumerators

- Make brief introduction to each farmer before starting the interview, get introduced to the farmers, (greet them in the local way) get his/her name; tell them yours, the institution you are working for, and make clear the purpose and objective of the study.

- Please ask each question clearly and patiently until the farmer understands (gets your point).
- Please fill up the questionnaire according to the farmers reply (do not put your own opinion).
- Please do not try to use technical terms while discussing with farmer and do not forget to record the local unit.
- During the process put the answer of each respondent both on the space provided and encircle in the choose

Identification Number (code) ----------
Peasant Association name ----------
Name of enumerator----------
Date of interview----------

I- PERSONAL FACTORS

1. Name of the respondent _____ Sex_____
2. Age of respondent _____
3. Marital status 1. Single 2. Married 3. Divorced 4.Widowed
4. Education level
   1. illiterate 2.can read & write 3. primary school (grade 1-6)
   4. secondary school (grade 7-12)
5. Total number of household members (active labor force) ----------

SN	Name of family members	Relationship to the respondent [(a)]	Age (15-64)	Gender 1: M 2: F
1				
2				
3				
4				
5				
6				
7				
8				
9				

[(a)] Relationship: 1: Husband 2: Son 3: Daughter 4: Relative 5: Raised 6: Other

II- SOCIO-ECONOMIC FACTORS

6. Do you own land? 1. Yes 0. No
7. If yes, mention the source and size of farmland? 1. Own farm size_____ 2. From share cropping_____3. Rented from other source_____
   7.1 Total land size covered by all crops (in timad) _____
   1- Coverage of coffee farm _____
   2- Coverage of haricot bean farm _____
   3- Coverage of maize farm _____
   4- others (specify)_____
8. What are the sources of family income?
   1- From farming activities 2- non farming activities 3- others specify
9. What amount of money you earn annually from your income sources?

_____

10. For what purpose you are using the money you get?
    1. To purchase inputs 2. To purchase cattle 3. Clothing 4. Home consumption materials
    5. Others specify
11. Is the price of inputs affordable? 1. Yes 0.No
12. If your answer is no, what was its impact on you in the use of improved crop inputs?
    1- using below recommended level 2- partly use of package inputs 3- decision for not using
    4-Others specify_____

III- SITUATIONAL FACTORS

13- Is there road facility which helps you for input purchase and market out late?
    1-Yes 0- No
14- If your answer is yes, what type of road you are using?
    1- all weather road 2- winter season road 3- others specify
15- If your answer for question 12 is no, how do you cope up?
    1- bare foot roads 2- others specify
16- What do you use to bring agricultural inputs from the source?
    1. Transport car 2. Own cart 3. Equines 4- others
17- How much hour will you spent to reach to the nearest input market from your home?

18- How do you evaluate the facilities related to road and transportation means in relation to input use?

_____

_____

_____

_____

19- Do you have access to market for your produce?
    1. Yes 0. No
20. If no, what is/are the main constraint (s) regarding access to market?
    1. Unable to get market information 2. Far distant of market place
    3. Unable to get alternative market 4. Lack of means of transportation 5. High market tax
    6. If other, specify_____

IV- ORGANIZATIONAL AND INSTITUTIONAL FACTORS

21- Are there credit institutions at your disposal? 1. Yes 0. No
22- If your answer is yes, what is the name of credit institution?_____
23- Are you ever used credit from the organization? 1. Yes 0. No
23.1- If your answer is yes, how frequent you are using credit from the institution?
1- once per a year 2- twice per a year 3- others specify_____
23.2- what is the type of credit you obtained? 1- in cash 2. in kind
23.3 If it is cash, for what purpose you borrowed the money?
1- to purchase inputs 2. For home consumption 3. Others specify_____
23.4 If your answer for 22.3 is to purchase inputs, what type of inputs you purchased?
1- Seed 2. Fertilizer 3. Farm tools 4. Pesticides 5. Others specify_____
23.5 If it is in kind, what are the inputs you borrowed?
1- seed 2. Fertilizer 3. Farm tools 4. Pesticides 5. Others specify_____
24- If your answer for question 20 is no, what is the source of your money to purchase inputs?
1. From own farm income 2.Borrowed from neighbors 3.Gift from relatives
4. Others specify_____
22.1 what type of inputs you purchased last year?
1- seed 2. seedling 3. Fertilizer 4. Farm tools 5. Pesticides 6. Others specify_____
25- If your answer for question 22 is no, what is your reason to not borrow?
1- High interest rate 2.Presence of own money 3.Lack of collateral
4. Others specify_____

26- What problem you are encountered related to input credit?

_____
_____
_____

27- What is your suggestion for efficient input credit service in the future?

_____
_____
_____

28. Is there storage facility nearby to store agricultural inputs? 1. Yes 0. No
29. If your answer is yes, what is its contribution to your farming activity?
1. to get inputs timely 2. To minimize transport cost 3. Others specify_____
30. If your answer is no, how much time do you spent to reach to the nearest input distribution center?_____
30.1 does the distance has negative effect on you in using agricultural inputs? 1.Yes 0. No
30.2 If your answer is yes, what do you suggest to improve the service?

_____
_____
_____

31. Is there service cooperative in your area? 1. Yes 0. No
31.1 If your answer is yes, are you a member of service cooperative? 1. Yes 2. No

31.2 If your answer is yes, what service do you get from service cooperative?
1. input credit 2. Crop marketing 3. Credit and saving 4. Others specify_____

32. If the service cooperative works on input distribution, being as a member what are the problems encountered during distribution and what is your suggestion to improve service delivery.

32.1 problems encountered

_____
_____
_____

32.2 suggested solutions

_____
_____
_____

33. If your answer for question 31 is no, what possibilities you have, to get services from a service cooperative ?

_____
_____
_____

34. Did you have any contact with Development agent in your area? 1. Yes 0. No
35. If yes, frequency of contact?
5. Once in a week 4. Once in two weeks 3. Once in three weeks 2. Once in a month 1. rarely 0.never
36. If no, why? 1. No DA nearby 2 . No need for service 3 .Others (specify)
37. What types of service most of the time you are getting from DAs?
1. Technical support 2. Theoretical information 3. Input Supply 4. Experience sharing
5. Others specify_____.
38. Are you ever participated in extension training? 1. Yes 0. No
39. If yes, in what area of extension training you have participated?

_____
_____
_____
_____

40. Was the training contributed for the use of improved agricultural inputs? 1. Yes 0. No
41. If yes what are the significant contribution of the training in using agricultural inputs?
1. increased the demand for fertilizer use 2. increased the demand for seed use
3. Increased the demand for farm tools use 4. increased the demand for pesticide use
5. others specify_____
42. If your answer for question 36 is no, why?
1. Not invited to participate 2. No interest in the program 3. Others specify

_____
43. Have you ever attended any farmers' field day last year? 1. Yes 0.No
44. If no, why?

1. Not invited to participate 2. No interest in the program 3. Others specify_____

45. Have you ever hosted, extension demonstration, or on farm experiments on your field last year?

1. Yes 0. No

46. If not, why?

1. Not invited to do 2. Not interest in the program 3. Others specify_____

VII- INPUT DEMAND – SUPPLY INDEX

47. What type of inputs are required and obtained last year?

No	Type of agricultural inputs	Unit	Required(1)	Obtained(2)	Sources of inputs
1	Maize				
	1.1 improved seed				
	1.1.1 BH-540				
	1.1.2 BH-660				
	1.1.3 BH-140				
	1.1.4 Others specify				
2	Haricot bean				
	2.1 improved seed				
	2.1.1 Awash-1				
	2.1.2 Awash melka				
	2.1.3 Others specify				
3	Coffee				
	3.1 improved seed				
	3.1.1 74110				
	3.1.2 74112				
	3.1.3 others specify				
	3.2 improved seedlings				
	3.2.1 74110				
	3.2.2 74112				
	3.2.3 others specify				
4	Fertilizer				
	4.1 DAP				
	4.2 UREA				
5	Pesticides				
	5.1 symbush				
	5.2 Others specify				
6	Farm tools				
	6.1 sickle				
	6.2 spade				
	6.3 *zabia*				
	6.4 saw				
	6.5 pruning sheave				
	1.4.4 Others specify				

48. Have you ever faced constraints on using the above-mentioned inputs? 1. Yes 2. No

49. If your answer is yes from the above mentioned crops on which crop you faced more constraints?
    1. Coffee 2. Haricot bean 3. Maize
50. What is/are the main constraint(s) you faced?
    1. Mismatch with the demand (in kind)2. Insufficient delivery 3.Poor quality of input 4. not timely 5. Source from far distance 6. Less Extension support 7. Exorbitant input price 8.If other specify_____

VIII- ACTORS MAPPING, LINKAGE AND KNOWLEDGE FLOW

51. Who are the actors in relation to input demand-supply? Indicate their function and strengths of linkages with you?(to indicate use "√ ")

No	Name of the actors	Function	Status of linkage			
			V/strong (3)	Strong (2)	Weak (1)	None (0)
1	OARD	- Knowledge transfer and input delivery				
2	NGOs existing in the area	- Knowledge transfer and input delivery				
3	Woreda input desk	- input delivery				
4	Farmers' service cooperatives	- input delivery and purchase of crop produce				
5	Woreda rural finance fund(RFF)	- credit service				
6	Awada Research Center	- Knowledge transfer				
7	Awassa Research Center	- Knowledge transfer				
8	Sidama Elto union	- input delivery and credit service				
9	Private seed multiplier farmers	- input delivery				
10	Sidama micro finance	- credit service				
11	Omo microfinance	- credit service				
	Others (specify)					

52. How do you evaluate the frequency of participation of actors in delivering improved agricultural knowledge? (to indicate use "√ ")

No	Name of the actors	Frequency		
		Frequently (2)	Sometimes (1)	Rarely (0)
1	OARD			
2	NGOs existing in the area			
3	Awada Research Center			
4	Awassa Research Center			
5	Others specify			

Appendix 2 Questionnaire for actors involved in agricultural inputs/services provision

- Name of the organization_____
- Address_____
  _____
- Major occupation _____
  _____
  _____
  _____

1.Types of agricultural inputs delivered to the farmers for last 3-5 years according to farmers demand (only applicable for material input providers)

SN	Types of inputs delivered	Unit	1996E.C		1997 E.C		1998 E.C		1999 E.C		2000 E.C		Total	
			D	S	D	S	D	S	D	S	D	S	D	S
1	Improved seed - Maize - Haricot bean - Coffee seed/seedling - Others (specify)													
2	Fertilizer - DAP - UREA													
3	Plant protection chemicals													
4	Credit													
5	Others (specify)													

Note: - D= demand S= supply

2. What are the opportunities for the organization to achieve the proposed goals?

_____
_____
_____
_____
_____

3. What are the major factors that influence the smooth functioning of the organization? Justify how each factor affects.

_____
_____
_____
_____
_____

4. Does your organization has any integration /linkage with related organizations.
   1/ yes 2/ no

5. If your answer for question 4 is yes, fill the following table? Use (√) to indicate

SN	Name of the organization	The status of linkage			
		V. Strong	Strong	Weak	None
1	Hawassa research center				
2	Awada research center				
3	Sidama elto crop union				
4	Wereda OARD				
5	Pioneer hi-breed seeds Ethiopia				
6	P.L.C				
7	IPMS				
8	Farmers in the project area				
9	Awassa seed enterprise (ASE)				
10	AISCO				
	Others specify				

6. What support you get from each of mentioned actors?

_____
_____
_____
_____
_____

7. Knowledge flow within the system

Operational definitions

Technical = Knowledge/information related to technology to be utilized (e.g. merit of improved varieties, how to control pests.etc)

Strategic = Knowledge/information related to future perspectives (e.g. keeping up of quality standards of coffee for export, improving productivity for better income, cost benefit analysis etc.

Operational = Knowledge/information related to activities to be under taken (e.g. adjusting planting time, use of short duration varieties to escape from drought, plant population per unit area and such managerial aspects.

Policy = Knowledge/information related to policy issues like organizing farmers for better market negotiations, channelizing incentives.

Market = Knowledge/information related to in the context of input-output marketing to benefit the farmers.

7.1 Types of knowledge/ information delivered by each actor

SN	Name of actors	Types of knowledge/information delivered					
		Technical	Strategic	Operational	Policy	Market	Other (specify)
1	Hawassa research center						
2	Awada research center						
3	Sidama elto crop union						
4	Wereda OARD						
5	Pioneer hi-breed seeds Ethiopia P.L.C						
6	IPMS						
7	Farmers in the project area						
8	Awassa seed enterprise (ASE)						
9	AISCO						
10	Others specify						

♣Put (X) mark on types of knowledge delivered by each organization/ partner

7.2 Frequency of knowledge flow with in the system

SN	Name of actors	Frequency of knowledge flow		
		Frequently	Sometimes	Rarely
1	Hawassa research center			
2	Awada research center			
3	Sidama elto crop union			
4	Wereda OARD			
5	Pioneer hi-breed seeds Ethiopia P.L.C			
6	IPMS			
7	Farmers in the project area			
8	Awassa seed enterprise (ASE)			
9	AISCO			
10	Others specify			

♣Put (X) mark in the appropriate column (only in one of the three columns)

8. Is/are there constraint/s in relation to policy environment? 1/ yes 2/ no
9. If your answer is yes what is/are the constraint/s?

_____
_____
_____
_____
_____

10. What do you suggest for improvement of your organization service in relation to agricultural input/service delivery?

_____
_____
_____
_____
_____

11/ Do you have a trend in collecting feedbacks from users? 1/ yes 2/ no

12/ If your answer is yes, what are the feedbacks for your services?

SN	Types of service delivered	Feedbacks from users
1	Input supply	
2	Credit provision	
3	Knowledge transfer	
4	Others (specify)	

13/ Does your organization incorporate users feedbacks in its plan, for better service?1/yes 2/ no

14/ If your answer is yes, what changes are made as the result of perceived feedbacks?

SN	Perceived Feedbacks	Changes made
1	Improving the quality of inputs	
2	Improving the quantity of inputs	
3	Improving input delivery network	
4	Improving input delivery timeliness	
5	Improving input credit delivery network	
6	Improving the type of knowledge delivered	
7	Improving the frequency of knowledge delivered	
8	Others specify	

15/ Does your organization has compensation plan for farmers who faced crop failure due to low quality of your inputs? 1/ yes 2/ no

16/ If your answer is yes, explain?_____

_____

_____

_____

_____

17/ Does your organization encourage users by giving incentives for better adoption of your inputs? 1/ yes 2/ no

18/ If your answer is yes, what criteria are used to select users and what type of incentives are given so far?

_____

_____

_____

_____

_____

19/ How do you evaluate your users satisfaction? Put (X) mark in the most appropriate column.

SN	Types of service delivered	Level of user satisfaction			
		Very good	Good	Fair	Bad
1 2 3 4	Input supply Credit provision Knowledge transfer Others specify				

20/ what is your suggestion for the smooth functioning of input demand supply system?

_____
_____
_____
_____
_____

Appendix 3 Check list for focus group discussions (FGD) for MHH

Name of PA_____

Name of farmers participated in FGD Occupation in PA

1._____ _____
2._____ _____
3._____ _____
4._____ _____
5._____ _____
6._____ _____

1. What are the possible agricultural inputs you use in your area and how do you explain agricultural input /service delivery related to coffee, haricot bean and maize?

2. Who are the actors involved in agricultural input/service provision? How is the status of linkage and knowledge sharing with you?

SN	Name of the actors	Function	Status of linkage with farmers			Frequency of K flow		
			V. strong	Strong	Weak	Freq.	Sometimes	Rarely

3. What are the influential factors related to input/ service provision and what constraints do you have in using inputs/services?
4. How do you rank the influential factors regarding input/service provision?

SN	Influential factors	Score	Sum	Rank

5. What are your suggestions to improve the situations?
6. What are the opportunities, which can be capitalized?

Appendix 4 Check list for focus group discussions (FGD) for FHH

Name of PA_____

Name of farmers participated in FGD Occupation in PA

1._____ _____
2._____ _____
3_____ _____
4._____ _____
5._____ _____
6._____ _____

1. Do you have access and utilization to agricultural inputs/services? 1/ yes 2/no
2. If your answer is yes, What are the possible agricultural inputs you use in your area and how do you explain agricultural input/service delivery related to coffee, haricot bean and maize?
3. If your answer is no, what are the reasons?
4. From whom do you share information/knowledge?

SN	Name of actors	Frequency of knowledge flow		
		Frequently	Sometimes	Rarely

5. What are the influential factors related to input/ service provision and what constraints do you have in using inputs/services?
6. What are your suggestions to improve the situations?

Appendix 5 Supportive and Detail result Tables

Appendix: 1 Input demand –supply data of the study area (2004-2008)

S. No	Type of inputs	Unit	2004		2005		2006		2007		2008		Total	
			D	S	D	S	D	S	D	S	D	S	D	S
1	Maize	Qt	240	172	617	248.5	532	330	535	330	600	215	2524	1295.5
2	H.bean	Qt	-	-	250	182	229.5	219.25	47.5	37.2	23	23	550	461.5
3	Coffee Seedlings[1]	Ps	0.6 M	0.88 M	1.26 M	1.73 M	2.0 M	2.72 M	2.5 M	2.6 M	3.12 M	3.13 M	9.48 M	11.06 M
4	Fertilizer													
	- DAP	Qt	2016	1662	6230	3200	5750	2820	2500	1800	2000	525	13320	10007
	- UREA	Qt	-	-	-	-	200	100	120	60	-	-	320	160
5	Credit [2]	Birr	607600	223800	297000	165400	-	-	-	-	-	-	904600	389200

Source: WARDO, 2009

[1]Coffee seedlings distribution was run mainly (90%) by coffee multiplier farmers and the rest 10% was supplied by public nursery sites as per need.

M = in millions

[2] The credit demand was requested by WARDO without considering farmers' need

Appendix table 2: Prioritization of the crops in terms of high level of constraints in input supply system

S.No.	Type of the crop	Frequency	%	Rank
1	Maize	109	54.5	1
2	Coffee	30	15	2
3	Haricot bean	19	9.5	3
	No response	42	21	
	Total	200	100	

Source: computed from own survey, 2009

Appendix table 3: Demand and Supply for seed during the 2005 agricultural season

Crop	Quantity demanded	Quantity supplied	Supply as a percent of demand
Wheat	518,487	106,279	20
Maize **	155,215	82,458	53
Barley	70,839	11,628	16
Teff	78,389	4,197	5
Faba bean	77,728	4,761	6
Chick pea	48,187	26,405	55
Haricot bean **	33,742	7,027	21
Sesame	21,769	6,046	28
Total (incl.others crops)	1,117,597	304,042	27

Source: MOARD 2005 ** Selected crops for the research project

Appendix table 4: Hybrid maize seed production by company, 2004.

Company	Percent of total maize supply
Ethiopian Seed Enterprise	70.0
Pioneer	16.1
Hawas Agro business	0.2
Awassa Farm Development Enterprise	1.3
Awassa Green Wood	4.7
Hadiya Trading Enterprise	1.5
Bako Agricultural Research Center	4.3
Ano agro industry	0.8
Anger farm	1.1
Total	100

Source: MoARD 2005

Appendix table 5: Respondents alternative measures for high cost of inputs (N=200)

S.No	Measures taken	Frequency	%	Rank
1	Using below recommended rates	127	63.5	1
2	Partly use of package inputs	43	21.5	2
3	Decision for not using	23	11.5	3
	No response	7	3.5	
	Total	200	100	

Source: computed from own survey, 2009

Appendix table 6: Identified actors and their role in input demand- supply system of the study area

Sector type	Name of the actor	Role	Remark
Public	WARDO	- technology introduction and promotion - extension service and input provision	
	ESE / Hawassa-Shalo	- introduction of seed varieties through demonstration - seed supply / maize and haricot beans/	
	Sidama Elto crop union	- Input supply for primary cooperatives/ WARDO	
	AISE	- fertilizer supply	Missed actor
	Hawassa Ag,Res. center	- technology generation - knowledge transfer - improved seed supply(Haricot beans)	
	Awada coffee research sub center	- technology generation - improved coffee varieties introduction	
	Farmers	- mobilization for improved technology use - provision of feed back through two way communication	
	Private seed multiplier farmers	- multiplication of coffee seedlings - provision of seedlings to growers	
	Wereda cabinets	- facilitation of over all systems activity - mobilization of people for development activities	
	Zonal ARDD	- technical support - facilitation of input credit - facilitation of improved seed supply	
	Regional BoARD	- facilitation of input credit and seed supply - technical support - capacity building/training/ - technology introduction	Missed actor
NGO	IPMS	- training for farmers and DAs - knowledge transfer - facilitation of market link	
Private investors or companies	Pioneer hi-bred private limited A.C	- improved maize seed supply - technical support	Missed actor

Appendix Table 7: Descriptions of independent variables

Variables	Variable type	Expected sign	Value
Age	Continuous	-	Measured in years equivalent
Education level	categorical	+	Measured in categorical scale
Family active labor force	Continuous	+	Measured in adult equivalent
Total farm land	Continuous	+	Measured in hectares
Annual income	Continuous	+	Measured in birr
Distance from nearest input market	Continuous	-	Measured in kms
Type of road used	discrete	-	scale
Access to market	Dummy	+	Takes a value of 1 for yes 0 otherwise
Access to credit	Dummy	+	Takes a value of 1 for yes 0 otherwise
Input price	Dummy	-	Takes a value of 1 for yes 0 otherwise
Extension contact	Continuous	+	Measured in number of contact
Storage facility	Dummy	+	Takes a value of 1 for yes 0 otherwise

Appendix Table 8: Variance inflation factor (VIF) for continuous independent variables

Variables	VIF
AGE	1.313
ACTLF	1.309
AMTLOW	1.704
ANINC	1.540
DFNIM	1.076

Appendix Table 9: Conversion factor used to compute man equivalent

Age group	Male	Female
< 10 years	0	0
10-14 years	0.35	0.35
15-50 years	1	0.80
>50 years	0.55	0.50

Source: Storck *et al.* (1991)

Appendix Table 10: Contingency coefficient test for discrete/categorical/dummy variables (N= 200**)**

	EDULVL	TYPR	TYTOPO	FRCODA	ACTMKT	ACTCRDT
EDULVL	1	.413	.253	.334	.073	.128
TYPRDUS		1	.377	.480	.211	.398
TYTOPO			1	.338	.290	.132
EXTCON				1	.167	.247
ACTMKT					1	.132
ACTCRDT						1

Appendix table11: Coefficient of regression function

Variables	Coefficients			
	β	Std.Error	t	Sig.
Constant	.821	.155	5.290	.000
AGE	- .004*	.002	-1.786	.076
EDUL	.086	.040	2.037	.203
NACLF	.036*	.021	1.726	.086
FARMS	.099	.070	2.131	.196
ANINC	.032	.019	1.374	.785
TYPRD	-.110***	.037	-2.942	.004
DFNINM	.007	.004	1.646	.101
ACCRDT	.096	.045	2.246	.245
ACTMKT	.034*	.018	1.698	.085
EXTCON	.028**	.014	1.982	.049

***, **, * Significant at 0.01, 0.05 and 0.1 level

R= .387 R^2 = 0.150 Adj R^2 = 0.105 F= 3.330 p = .001

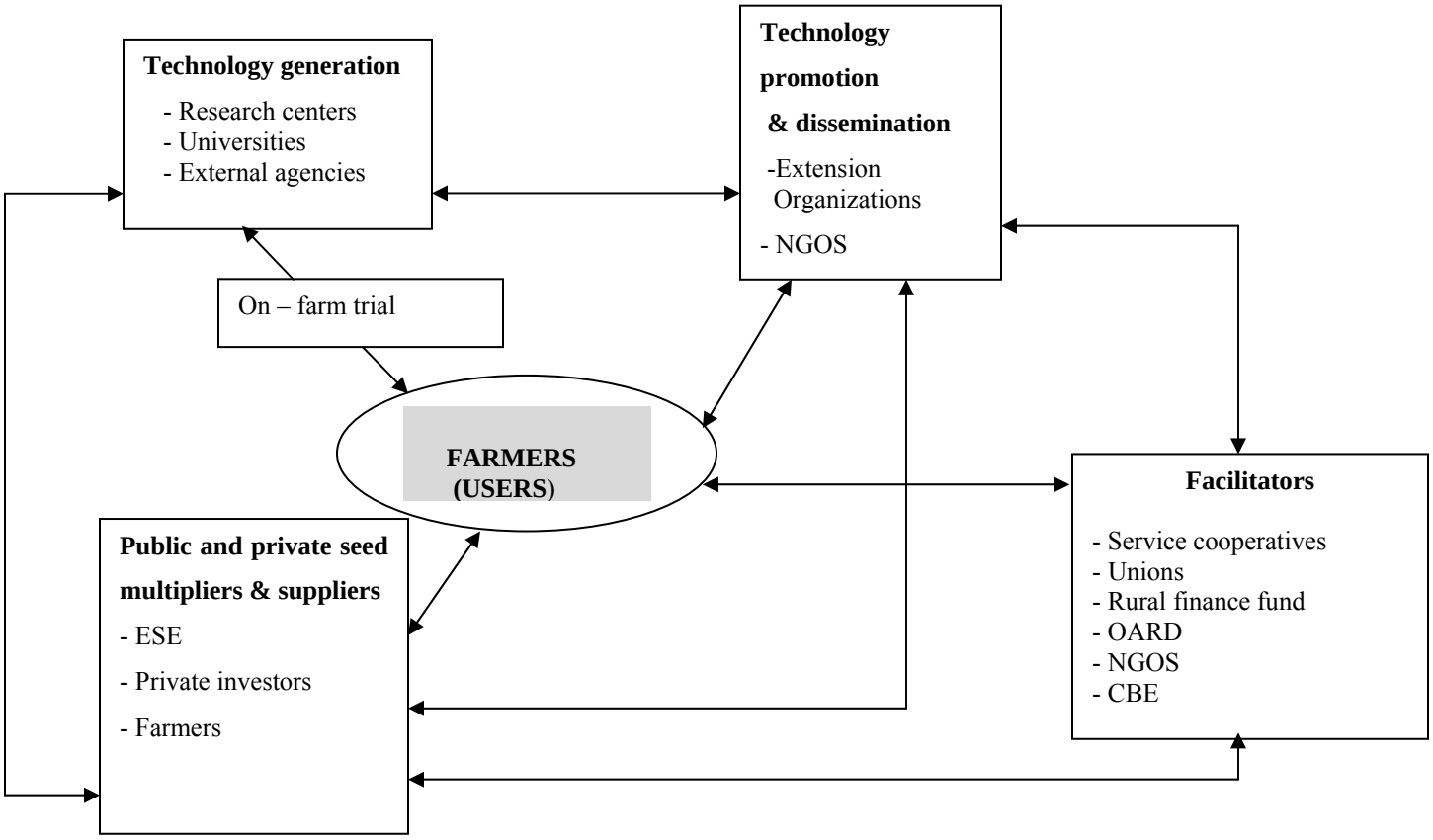
Appendix Table 12: ANOVA of the regression function

	Sum of squares	df	Mean square	F	Sig.
Regression	2.527	10	.253	3.330	.001
Residual	14.345	189	.076		
Total	16.872	199			

ANOVA results in table 12 shows that the regression is significant at 1% level

Appendix 5 Supportive Figures

Appendix Figure 1: Map of agricultural input – supply system



Source: SZARDD, 2009.

Key:

↔ Two way communication